DOCUMENT RESUME

ED 205 243 JC 810 474

AUTHOR Shabat, Oscar E.: And Others
TITLE First National Mastery Learning Conference: Summary of the Conference Proceedings (Chicago, Illinois, June 5-7, 1980).
INSTITUTION Chicago City Colleges, Ill.
PUB DATE Jun 80
NOTE 43p.

EDRS PRICE MF01/PC02 Plus Postage.
DESCRIPTORS Academic Ability: Community Colleges: *Educational Research: Formative Evaluation: *Mastery Learning: *Program Implementation: Student Evaluation: Summative Evaluation: Teacher Response: Teacher Role: Two Year Colleges: Workshops
IDENTIFIERS Bloom (Benjamin S): Carroll (John B)

ABSTRACT

The proceedings of the First Mastery Learning Conference begins with Rocco Caponigri's introduction and Oscar E. Shabat's discussion of the importance of mastery learning to community colleges as they attempt to educate large numbers of underprepared students. Next, Benjamin S. Bloom examines the shifting emphasis in education research from investigations of static student and teacher characteristics to examinations of alterable variables that can be used to adjust the learning process according to individual student needs. Mr. Caponigri reviews the pioneering research of John Carroll and Benjamin Bloom prior to Thomas Guskey's discussion of faculty and student orientations to mastery learning, the concerns teachers commonly have when first applying it, and methods of evaluating mastery learning programs. After Emmett Jones describes the orientation sessions he uses to familiarize students with the mastery learning approach, five conference workshops concerning the development of topical outlines, instructional objectives, formative quizzes, corrective processes, and summative evaluations are summarized. Mr. Caponigri then reviews the implementation, management, and outcomes of the Mastery Learning Program at the City Colleges of Chicago, and Hymen M. Chausow discusses mastery learning as an affirmation of teachers' professionalism and as a means of reducing student attrition. Biographical sketches of the conference speakers are provided. (JP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED205243

FIRST NATIONAL MASTERY LEARNING CONFERENCE JUNE 5, 6, 7, 1980 SUMMARY OF THE CONFERENCE PROCEEDINGS

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY

Rocco Caponigri

TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

U.S. DEPARTMENT OF EDUCATION
NATIONAL INSTITUTE OF EDUCATION
EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)

☐ This document has been reproduced as received from the person or organization originating it.

X Minor changes have been made to improve reproduction quality.

• Points of view or opinions stated in this document do not necessarily represent official NIE position or policy.

City Colleges of Chicago

JC 810 474

TABLE OF CONTENTS

SECTION I	Introduction	Page 1
SECTION II	Challenge of the 80's: Oscar E. Shabat	Page 3
SECTION III	Mastery Learning - Alterable Variables: Benjamin S. Bloom	Page 5
SECTION IV	Historical Perspectives of Mastery Learning: Rocco S. Caponigri	Page 13
SECTION V	Evaluation of the Effectiveness of Mastery Learning: Thomas Guskey	Page 15
SECTION VI	First Day of a Mastery Learning Class: Emmett L. Jones	Page 22
SECTION VII	Workshops: Mastery Learning in the Classroom	Page 26
SECTION VIII	The Development of a Large-Scale Mastery Learning Program in a Community College System: Rocco S. Caponigri	Page 30
SECTION IX	Administrative Aspect of Mastery Learning: Hymen M. Chausow	Page 35
SECTION X	Speakers, Workshop Leaders, Participants	Page 38

THE FIRST NATIONAL MASTERY LEARNING CONFERENCE: INTRODUCTION

On June 5-7, 1980, the Mastery Learning Project of the City Colleges of Chicago sponsored the First National Mastery Learning Conference held in Chicago with activities held at the Oxford House, the Loop College, and Pioneer Court Restaurant—providing both theoretical and practical orientation to the Mastery Learning techniques employed by more than 250 members of faculty of the City Colleges of Chicago.

Mastery Learning theory was discussed during the Conference's several plenary sessions following an opening night welcoming speech by City Colleges of Chicago Chancellor Oscar E. Shabat and a keynote address by Dr. Benjamin Bloom of the University of Chicago, one of Mastery Learning's principal theorists. This document, The Summary of Proceedings, presents edited texts of the principal presentations from the keynote banquet and the plenary sessions. In addition, materials are included that illustrate Mastery Learning principles at work in specific classes; this practical use of Mastery theory was the main emphasis of the several workshops offered during the Conference. City Colleges of Chicago Mastery Learning instructors taught the workshop participants ways to develop:

> Topical outines for one or more units of a course the participant usually taught,
>
> Course objectives and specification tables,
>
> Parallel forms of formative quizzes,
>
> Correctives useful in Mastery Learning,
>
> Alternative methods for enriching instruction, including peer tutoring and Computer-assisted instruction and
>
> Achievement criteria and summative evaluations.

We found that this "hands-on" experience in the workshops was invaluable to the many faculty who came to the Conference never having worked with Mastery Learning strategies. We plan to duplicate this approach in subsequent Mastery Learning conferences, the next of which will be held May 27-29, 1981. More on that in a moment.

A brief word about Mastery Learning in general and the particular Mastery Learning Program of the City Colleges of Chicago is appropriate here before any final comments on the 1980 Conference and a word about the forthcoming Conference in May. Mastery Learning is an instructional strategy designed to raise the performance of most students to the levels of academic achievement previously attained only by "A" students. Mastery Learning helps students to learn by dividing the entire course into smaller "learning units," by specifying unit objectives, by providing students with accurate and frequent feedback on their learning progress, and by prescribing and providing alternative learning experiences (correctives) for those students who need them. It is a highly structured approach to classroom learning which attempts to provide the optimum conditions for student learning, thereby allowing mastery to be achieved within the traditional semester.

Dr. Benjamin Bloom, University of Chicago, developed the Mastery model used in the City Colleges of Chicago. As a teaching philosophy which asserts that under appropriate learning conditions virtually all students can learn well what the schools have to teach, Mastery is not a new idea. This concept appears in various forms in the writings of ancient philosophers and mathematicians; later, it was incorporated into the pedagogy of Jesuit schools; and still later it appears in the writings of philosophers such as Pestalozzi and Herbart and educators such as Washburne and Morrison. The current resurgence in interest in Mastery Learning can be traced back to John Carroll's article, "A Model of School

Learning" (1963), in which he argued that aptitude can be equated to learning rate. In 1968, Dr. Bloom expanded Carroll's model and developed a classroom application which he described in his article "Learning for Mastery." In the same year Professor Keller presented his "Personalized System of Instruction," a different Mastery model, in his landmark book, Goodbye Teacher (1968).

The City Colleges of Chicago have been experimenting with and refining the techniques of Mastery Learning for more than seven years. Over 25,000 students have participated in Mastery Learning classes, and more than 400 faculty have used Mastery strategies during this time. The Mastery Learning Program is administered for the City Colleges of Chicago through the system's instructional and staff development program, The Faculty-Staff Center, located at Chicago City-Wide College, 185 North Wabash, Chicago, Illinois, 60601. The Mastery Learning Program has developed curriculum materials and a Mastery Learning library and has willingly made its resources available to instructors from community colleges nationwide who have expressed interest. The Program will host the Second National Mastery Learning Conference on May 27-29, 1981, at the Palmer House Hotel in Chicago.

The large urban community college districts that sent representatives to the first Conference approved a proposal made by City Colleges' Chancellor Shabat and Professor Bloom to join in a consortium which would jointly sponsor a national research facility for community college educators. On January 26, 1981, Chancellor Shabat announced the formation of the Center for the Improvement of Teaching and Learning, which will be located at the City Colleges of Chicago. This National Center will be formally announced to the participating institutions at the Second National Mastery Learning Conference in May, and its program of research and development projects will be presented at that time. We encourage you to attend our next Mastery Learning Conference, and we hope you find this document informative and useful in your curriculum planning and teaching. The success of our First National Conference is due in large part to the professional interest and enthusiasm for new ideas of each of the Conference participants. We thank you all for your participation and extend our special appreciation the the administrators of the City Colleges of Chicago and all participating institutions, to the professional staff of the Mastery Learning Program and the Faculty-Staff Center, and finally to our many fine Conference presenters. We look forward to seeing you in Chicago on May 27-29, 1981.

Rocco S. Caponigri, Ph.D. Director, Mastery Learning Project City Colleges of Chicago

REFERENCES

Bloom, Benjamin S. Human Characteristics and School Learning. New York: McGraw-Hill Book Company, 1976.

Carroll, John B. "A Model of School Learning." Teachers College Record, 1963, Vol. 64, pp. 723-733.

Keller, F.S. "Goodby Teacher...." Journal of Behavior Analysis, Vol. 1, p. 79-89.

CHALLENGE OF THE 80'S

By Oscar E. Shabat, Chancellor
City Colleges of Chicago

A summary of his comments at the conference

If this conference were being held two years from now, it would be held in the new Loop College, a college designed to meet the educational challenges of the 80's. The college will be constructed at the northwest corner of Wabash and Lake. It is an eleven story building that will have 344,000 square feet of space. It will be attractive as well as functional. It will serve the degree-seeking student as well as those students who wish to develop particular marketable skills. It will also serve those who wish to update their skills.

...New Loop College To Reach Out
To The Loop's Business Community...

The new building will help us reach out to the Loop's business community. We will be able to tell business leaders that we have the faculty and the facilities right in the Loop to serve their needs. One of the growth areas of the 1980's will be in the service industry. The new Loop College will be ready to meet the needs of that community. The college will prepare people of all ethnic and racial backgrounds, not only for entry into college, but also for well-paying middle-level jobs as junior executives, supervisors, and technicians.

On behalf of our Board Of Trustees and the City Colleges of Chicago faculty and staff, welcome to Chicago and have a very enjoyable two and one half days! You will be seeing Vice Chancellor Chausow and me here throughout most of that time. This conference is a real highlight in the history of the City Colleges of Chicago. I hope that it will work out as well as we have planned.

...Some Observations...

Before introducing our guest speaker for this evening, I would like to share some observations I have made over the 40 years I have been with the City Colleges of Chicago.

Looking over the community college movement, particularly in Chicago, I recall that in the 40's and 50's community colleges contained a variety of students and we were attempting to find ways of dealing with them. As a faculty member I recall meeting with other faculty in order to solve the common problems we were having with our students. In those days I remember hearing the cry, "These students are not college material!" Does this complaint sound familiar? Mind you, I am speaking of a time when most of our students were transfer-oriented.

I now recognize but can't fully appreciate what it has meant to be in the classroom the last 10-15 years when enrollment went from 30,000 to 100,000 students. As the numbers increased, so did the variety of students, which, in turn, increased the number of problems the teacher had to resolve. Accordingly, the mission of the community college was enlarged and continues to be enlarged to meet the needs of an increasingly diverse student body. For the most part, we have met the challenge very well.

Like most community college systems, we offer a great variety of programs. We attempt to attract and develop the very best staff available to work in these programs. While the years have brought dramatic changes in the kinds of students we serve, our philosophy has remained the same: meet the educational needs of our community!

We must be prepared to meet the challenges that the 80's will bring. Many predict the demise of community colleges. They say that intense competition from the four-year institutions for traditional college-age students (17-21) will eliminate these students from the community college. I don't accept this forecast. We will continue to appeal to this age group because we will provide them with good facilities, with good programs and most importantly, with good teachers.

...Focus on Retention...

Of course we should recruit students, but recruiting is not the entire answer. A larger concern, I believe, is retention. All of us in the big cities should be doing more in this area. When you lose 40, 50, 60, 80 percent of the students in a course or a department, you don't have to worry about recruiting. You are in a mess. While such huge attrition is very discouraging, community colleges must find efficient and effective ways not only to recruit but also to retain their students.

Perhaps institutions that educate our teachers should be looking at strategies and curricula designed to assist prospective teachers in coping with the problems of retention and performance. Our teachers are well prepared in their subject areas, but they are often not well enough prepared to face the learning problems brought to them by our students. I am not saying that these problems have a simple solution, but we must start thinking seriously about ways to define and solve them. We must begin to experiment with new strategies and techniques. We must find ways of sharing information about both our successes and our failures.

Imagine the teacher who comes prepared with a master's or doctor's degree and faces increasing numbers of students who, though they may be highly motivated, do not have the requisite skills for their courses. Faculty may find it even more difficult to teach students who not only lack the prerequisites but also lack the discipline and self-confidence to become successful students. This should not surprise us. In many cases our students have been convinced by their repeated failure in the classroom that they cannot learn. Thus, teachers must learn how to make a difference: they need to learn teaching techniques that will enable students to have an experience of success. Our students have that coming!

...Our Students Deserve
A Chance At Success...

Community colleges are the hottest thing in higher education. If they are to remain so, they must face the challenge of providing quality instruction to a new and diversified student body. Dr. Bloom and Dr. Guskey are here to help. On a number of occasions I have heard Dr. Bloom say, "Mastery learning is not a panacea, and it is not the only effective teaching technique." He says, "Try other techniques that are known; invent some of your own; or at least try adaptations of existing techniques." Dr. Bloom and others tell us that most of our students can learn if both teachers and students clearly understand their objectives. The important thing is that we all show a willingness to learn ourselves.

...Quality Instruction Top Priority...

Since community colleges have an open door policy, we have an obligation, both moral and legal, to teach the students that come to us. To meet the challenges of the 80's, quality of instruction should be our number one focus, I firmly believe that community colleges are admirably suited to meet the challenge. We have the versatility, the flexibility, and the resiliency to succeed. If we are willing to work, I am certain that the community colleges will remain the hottest thing in education.

MASTERY LEARNING - ALTERABLE VARIABLES

By Dr. Benjamin S. Bloom

A summary of his comments at the conference

A major revolution has taken place during the past decade in educational research and in our understanding of the factors that influence learning. It is now possible to describe the learning conditions that will enable virtually every student to learn to a high standard of performance. So promising are the findings that researchers who were at one time concerned about providing equality of educational opportunity are now concentrating on the learning conditions that bring about equality in educational outcomes.

Two movements have come together to account for these striking research developments. The first of these is the movement away from the study of the static characteristics of teachers and students and toward direct observations of the dynamic learning process that develops within teacher/student interactions. Increasingly, educational researchers are conducting classroom experiments in which selected variables are studied in terms of their influences on the learning process as well as the changes they produce in teachers and learners.

...Static Versus Alterable Variables...

Perhaps the most important movement is the de-emphasis of what I have termed "stable or static variables" and the substitution of variables that are alterable, either before the teaching/-learning process begins or as a direct result of the process. This shift enables us to move from predication and classification of learners to the search for causality or the relationship between the means and the ends of teaching. The search for alterable variables and the causal processes by which they can be altered is a relatively recent development but one that should remain a central issue in educational research for the decade to follow.

...Why Are Variations in Learning Greater Than Other Human Variations...

For the past two decades, my major interest has been the study of the nature of man, especially the variation found within the species. If we take a thousand individuals, measure them on some biological function or characteristic such as temperature and then exclude the person at the top and the one at the bottom, we find the difference between the remaining top individuals and those at the bottom to be in the order of about 10 to 20 percent. When we turn to physical characteristics, such as height or strength, we find that there is about a 30 percent difference between the highest individuals and the lowest. When we study short-term memory, we find that one person can retain up to twice as much material as another. With the more biologically determined human measures, the ratio of differences between individuals at the extremes, excluding the exceptional, seldom exceeds two to one.

However, when we turn to learned human abilities, we begin to find enormous differences. If we examine children entering the first grade, one child may have a vocabulary of 5,000 words while another may have a vocabulary of 40,000 words--an eight to one ratio. As children are measured on learning at different grade levels, the variation in performance among students increases as the grade level increases. Why is there so little variation in basic human characteristics and so much in learned performance? We have always assumed that education brings about equality but in reality it has become the means to make men unequal and enormously different.

...What One Can Learn, All Can Learn...

In my book, Human Characteristics and School Learning, I developed a theory that attempts to explain individual differences in school learning, and I explored ways in which such differences may be altered. I found that many individual differences in school learning are man-made and accidental rather than fixed at the time of conception. Based on this research, I have concluded that what any person in the world can learn, almost all persons can learn if they are provided with appropriate prior and current conditions of learning.

I will qualify this conclusion, however, by stating that there are some individuals, perhaps 2 to 3 percent of the population, with emotional and physical difficulties that are likely to make them exceptions to this generalization. At the other extreme are the 2 percent of the population who learn in such unusually capable ways that they, too, cannot be fit into the theory. For example, it has been said of Enrico Fermi that, at the age of 12, he borrowed a calculus book from a neighbor who was a professor at the University of Rome. Fermi returned the book the next day. The professor, hoping to be a positive influence in the boy's intellectual development, chided him, saying, "Don't give up so quickly; calculus is important. Keep the book six weeks if you want, and if you need help, I will be willing to give it." Fermi replied simply, "I have learned the calculus." Fermi and those at the other end of the spectrum cannot be accounted for by my theory of school learning. The theory applies to the middle 95 percent of the school population.

I will try to summarize some of my ideas by relating them to several commonly accepted constructs about students, their learning capabilities, and the conditions that allow them to learn at a high level of achievement.

...The Myth of the Good and Poor Learner...

When I began my research career, the prevailing notion was that learners differed in their ability to learn and that the normal distribution most accurately described quantitative differences in learning ability. Learning ability was regarded as highly stable throughout life and, understandably, intelligence and aptitude tests became widely used as predicators of later school achievement. If, in a longitudinal study, we were to measure children at grade 3 and then at grade 11, the correlation between their performance at these two grades would be in the order of 85. If we were to rank these children, only about 10 percent would change their order between grade 3 and grade 11.

Another common belief that I encountered was that good learners were able to learn the complex and abstract ideas of school subjects, while poor learners were limited to the simplest and most concrete of ideas. If we fully accept this construct, there is little or nothing the school can do about learning ability—"Some have it; some don't!" We are then inevitably led to conclude that the task of the school is to weed out and eliminate poor learners while encouraging good learners to get as much education as possible. It is this construct of the good and poor learner that justifies the way we grade our students, our streaming practice, and our selective system of education. Most school systems in the world are based on this construct; parents, teachers, school authorities, examining bodies, and, finally, the students themselves have unquestioningly come to accept it. In most countries, the good student/-poor student concept influences guidance programs, the amount of education individual students receive, and the careers and occupations made available to them. The results are reflected in the economic and social hierarchy seen in many of these countries.

...Carroll's Model of School Learning...

There is a second construct that states that there are fast learners and there are slow learners. At first glance, this may appear to be the same as saying good and poor, but, in reality, it isn't quite the same. In 1963, John Carroll presented a model of school-learning postulating that individuals differed in their rate of learning and that this rate could be predicted by aptitude or intelligence tests. While there was some ambiguity about whether rate of learning is a permanent and stable individual characteristic, the model made clear that most learners could achieve equally high levels of learning in school subjects if each student is provided with the time and help he needs when it is needed.

According to the Carroll model, if we give an aptitude test and then we teach students something relevant to that aptitude, being careful to give all students exactly the same instructional content and exactly the same amount of time in which to learn, we get an achievement distribu-

tion that matches the aptitude distribution. The top students in aptitude will be the top students in achievement; the bottom students in aptitude will be the bottom students in achievement. The correlation between aptitude at the beginning of the year and achievement at the end of the year will be about .70.

On the other hand, if we give another group of students whatever time they need to learn the specified tasks, then the distribution of achievement is skewed--most of the students reach the top of the achievement test. The correlation between aptitude and achievement will approach zero. But, Carroll warned, because learners vary in their rate of learning, some students will need five times as much time to learn as others. The problem then is, how do you provide the extra time and help everybody needs? There is a way.

...Summative Testing...

My students and I studied educational practices in various countries including the United States, Canada, the Netherlands, Finland, Sweden, Scotland, Australia, Italy, Indonesia, South Korea, Japan, and Malaysia. The research was done at all levels of education including primary, secondary, two-year colleges, four-year colleges, and schools of medicine, engineering, and nursing. We found that in the usual classroom setting students were given tests at the end of specific learning tasks, and then graded for their performance. The marks for these tests accumulated and were averaged in with final exams and other major exams. This is the traditional grading system throughout the world and is what I call "summative testing," in that every test counts toward a grade in some way.

Summative tests are used to classify or judge students to the extent in which they have learned the content or objectives set for a course. Typically, once the student has taken a test, he is graded and almost never given a chance to correct his errors and be retested. In general, the basic notion is that all of the students have had the same opportunity to learn the subject over a fixed period of time, and they should be judged on what they have learned within that time frame. The fact that those who did not learn might have successfully learned the required content with one additional week of work is not a relevant consideration.

Conventional instruction persuades students that there are "A" students and there are "D" and "F" students, under the assumption that test results and grades are the most effective means of motivating students to learn. "If we don't have grades, nobody would learn," is the usual view. It is not surprising that our educational system has gone from using grades as estimates of the quality of learning to grades as indices of the quality of the learner.

The use of summative testing procedures, whether they are quizzes, progress tests, or final examinations, results in highly stable measures of achievement. Typically, the correlation between achievement tests in the same subject at two points in time are above .70. We find that if we measure children's achievement at the end of grade 3 and then again at the end of grade 11, the correlation between achievement in the two grades is .85. Many researchers and educators infer from this that the differences in achievement are non-alterable; they are fixed by intelligence, heredity, home influences and other conditions outside of the school. This remarkable stability leads many to conclude that the causes for poor achievement and the corresponding remedies are not to be found within the school. The assumption is that it is the student who has failed; the teacher, the instruction, and the curriculum are not to be held responsible.

...Effects of Traditional Grading...

As part of our design, we altered this approach by taking the test given at the end of every learning unit and simply using it to take stock of what the student has learned but not for assigning grades. We call this "formative testing."

...Formative Testing...

Through the vehicle of the formative test, the students received feedback that permitted them to correct their errors. The feedback loop, which consisted of a formative test followed by a corrective process, is the essence of what we call "mastery learning." By the use of this method we ensured that students always had the prerequisites for learning the next unit. It is important to note that there is no qualitative difference between summative and formative tests with regard to

content. The difference is that one is used for grading students; the other is used for feedback and correction. If feedback is provided to help the student correct errors, then with additional time and help, most students do reach the standards set by the teacher.

...Learning To Learn...

In various studies, it has been found that if 20 percent of the students reach the mastery standards on a formative test given at the end of a two-week learning task, then with an hour or two of corrective effort, most students will be able to reach the mastery standard. In addition, over a series of learning tasks, the proportion of students reaching the standard before a corrective is required increases on each successive task until as high as 80-90 percent of the students are able to reach the mastery level on the first attempt. It is as though the students learn how to learn.

Using formative tests in this way ensures that most students will have the necessary prerequisites for each new task, while simultaneously increasing the students' interest in learning. The formative testing and corrective process appears to improve students' confidence in their ability to learn with the result that they use more of their classroom time to actively engage in learning. Also, the fact that formative tests are useful in helping the teacher determine which tasks were poorly learned permits the teacher to determine which skills need to be taught in a different way. As a result, teachers do less in the way of grading and judging students on what they have learned within a given time and more to see that each student learns what he needs in preparation for the next learning task.

Professor Harry Broudy, University of Illinois, has written a book, The Exemplars of the Teaching Method, in which he reviews the work of Socrates, Pestalozzi, Herbart, Froebel and the like. What he found in all of these exemplars of teaching was that they made a distinction between the "trial test," which was a test to help correct a student's errors, and the "final test," which was to be used to grade students. Somehow this distinction held for over 2,000 years. I think it was only within the last century that the notion of the trial test was dropped. We have now had to invent a new world like "formative test" to resurrect a notion that existed for over 2,000 years.

...Quality of Instruction...

If, at the beginning of a new course, we take two groups of students who are comparable in terms of aptitude and previous achievement, and on the first learning task one group learns the subject under a very high quality of instruction (tutoring, mastery learning, etc.), then, in the second task, the percent of time spent in learning will tend to be greater for students in the high quality group than for the poorer quality instruction group. Correspondingly, if both groups are followed throughout the school year and over a series of learning tasks, it will be found that the group with the higher quality of instruction increases greatly in the percent of "time on task." On the final learning task, the two groups also will be very different in achievement, motivation for further learning the subject, and self-confidence in their learning ability. "Time on task," then, is one of the variables that accounts for learning differences among students and, we shall see, among nations.

We undertook a study of secondary school students studying mathematics in twelve countries. When we compared U.S. and Japanese students we found that most of the U.S. students would receive failing grades if they were judged by Japanese standards. On the other hand, if we use U.S. standards, we would have to invent a grade of A + + + to account for Japanese achievement. When we explored the reasons, we found that U.S. students who took mathematics each year from grade one to grade twelve had approximately two thousand hours of instruction in mathematics. The Japanese had a slightly different amount, but roughly also about two thousand hours.

However, in terms of the proportion of time that American students actively engaged in learning in their classroom, we found that it was approximately 50 percent of the classroom hour. Japanese students, on the other hand, actively engaged in learning 90 percent of the classroom hour. With U.S. students having only 1000 hours of "effective" instruction in mathematics compared to the Japanese students' 1800 hours, one does not have to search long for basic differences in the achievement of Japanese students versus our own. We might point out that the size of the Japanese classroom is roughly 50 students per teacher instead of 30 as in the U.S.. We typically find that the "time on task" under conventional instruction is somewhere around 50 percent; under one-on-one tutoring, it is 90 percent or more. Let us look further into the issue of "time."

...Time Available For Learning...

There are two kinds of time; one is the time available for learning, and the other is the time students actively engage in learning—what we have been referring to as "time on task." We have always recognized time as the central factor in all learning. Schools allocate a block of time for different subjects (i.e., reading, literature, mathematics, science, etc.), and the number of days in the school year and the number of hours per day or week that will be assigned to each part of the curriculum is closely defined. Time, in sense of years, days and hours available for school learning, has become relatively fixed and stable. The legal, economic and political sanctions imposed at the state or local level to insure compliance with time standards is such that only rarely can a group of teachers or local school administrators make drastic changes in the way time is allocated. Because these time allocations are essentially the same for all students, they account for only a small part of the variation in achievement among students.

...Time on Task...

Quite in contrast to the concept of "time available for learning" is the variable "time on task," which is the time the student is actively engaged in learning for 90 percent of the class room hour. When another student is engaged for only 30 percent of the hour, there will be qualitative differences in learning between these two students. Studies show that the percent of time engaged in learning for individual students or groups of students is highly related to later measures of achievement, interest and attitude toward learning. In turn, "time on task" is largely determined by the quality of instruction and the extent to which the students have the cognitive prerequisites for a particular learning task. Students cannot become actively engaged in learning if the instruction is poor or if they are unable to comprehend what is being taught. It is most important for educators to realize that the amount of time of active involvement in the classroom can be altered and can be a powerful influence on educational outcomes.

...Cognitive Entry Characteristics And Achievement...

The next set of alterable variables are those we call "entry characteristics," i.e., what a student possesses when he enters a course. There are two kinds of entry characteristics. One is a measure of aptitude or intelligence, and the other is a measure of what can be learned. During much of the present century, educators have made use of intelligence and aptitude tests to predict later school achievement. In general, the statistical correlations between these tests and achievement have been found to be somewhere between .50 to .70, which has led educators to conclude that intelligence and aptitude determine an individual's potential for learning. Therefore, we now use these tests as the basis for making long-term selection and placement decisions. Intelligence and aptitude scores determine a student's opportunities for further education, financial support, and even the interpersonal relations between the teacher and student.

There is evidence that intelligence test scores are alterable in a child's early years (before 7 to 8 years of age), but there is little evidence of significant alterations in levels of intelligence as a result of school experiences in later years. Also, little is known about the alterability of the performance on specific aptitude tests, so at least on the basis of present evidence, we may regard both intelligence and aptitude test scores as highly stable.

Quite in contrast to the intelligence and aptitude indices are the cognitive entry characteristics which include the specific knowledge, abilities or skills that are the essential prerequisites for learning a particular school subject or task. The cognitive entry characteristics typically correlate at .70 or higher with measures of achievement. Furthermore, when they are identified and measured, they replace intelligence and aptitude tests in predication of later school achievement. In fact, intelligence tests add little or nothing to cognitive entry characteristics in predicting school learning.

For me, cognitive entry characteristics have an obvious causal and deterministic effect on later achievement. Their effect is especially apparent when there are sequential learning tasks where it is essential to adequately learn Task A before proceeding to Task B. Cognitive entry characteristics can be said to be highly alterable because they represent skills that may be learned if absent, reviewed if they have been forgotten, and learned to a criterion level if they have been learned at a lesser level.

...Achievement and Intelligence...

In many of the schools where mastery learning has been used, it is evident that the large gains in final achievement for the mastery students compared to conventional instruction groups came about because the mastery students were brought to high levels of achievement on the prerequisites for each new learning task, something rarely done in conventional settings. Where schools provide the means for insuring that students reach adequate levels of competence on essential cognitive entry behaviors, they can be assured of high levels of learning with very little variation in achievement among students. The alterability of cognitive entry characteristics has the most profound implications for instruction, curriculum design, and our views about the learning potential of students. Keep in mind that the correlation between intelligence and achievement is typically about .60 for students under conventional instruction, approximately .20 under mastery learning conditions, and exactly with one to one tutoring. We must then conclude that intelligence and aptitude do not control learning if we have a high quality of instruction.

...Characteristics of Teachers...

Over the past four decades, there has been a great deal of research on the relationship between teacher characteristics and student learning. The research has been concerned with such variables as the teacher's age, training, teaching experience, membership in teacher oganizations, personality and attitudes, and teacher performance on achievement tests related to their field of expertise. In general, the correlation between the characteristics of teachers and the learning of their students has typically been close to zero. Now, it may very well be that the researchers have not selected the right characteristics for study; however, based on the research done so far, it appears that what teachers bring with them to the classroom has little to do with what their students learn.

Even if there was a higher relationship, most of the characteristics of teachers studied so far are static and not directly alterable by in-service or other teacher training programs. Fortunately, there is recent research on the qualities of teaching as opposed to the qualities of the teachers that promises to yield a highly useful set of alterable variables. Largely based on observation and controlled experimentation, these studies concentrate on the teacher/student interaction.

...Cues, Reinforcement and Participation...

Although there are many ways of doing this research, some of us have been influenced by the theoretical work of John Dollard and Neal Miller who emphasize three major characteristics of teaching--cues, reinforcement, and participation. Cues include the instructional material as well as the directions as to what the learner is to do in the learning process. In this respect, much of the research relates student learning to the clarity, variety, meaningfulness, and strength of the explanation and direction provided by the teacher and/or instructional material.

Reinforcement refers to the extent to which the student is rewarded during the learning process. Research in this area relates student learning to the great variety of reinforcers. Some teachers think that if they say "good" frequently enough they are providing an effective reward, but after a while it ceases to be. We keep using a small number of reinforcers, while, in reality, there are a thousand ways of reinforcing students.

Participation refers to the extent to which students actively engage in the learning process. Here the research relates learning to the degree in which the student uses cues, makes appropriate responses, practices the responses until they become a part of his repertoire, and the ability of the instructor and/or instructional method to engage the student in overt as well as covert participation. Observations of classroom interactions of teachers and students reveal that teachers frequently direct their teaching, explanations and positive encouragement to some students but not to others. Teachers also have been found to elicit participation in the classroom from some students, while discouraging it from others. These studies typically find that the students in the top third of the class are given the greatest attention, while the students in the bottom third of the class receive the least attention and support. For example, Brophy and Good observed elementary classes in Texas and found that if students fell in the top third of the class, their chances of being called on when they raised their hand to answer a question were ten times greater than it would be for students in the lower third.

...Quality of Teaching Alterable
Through in-service...

Fortunately, the qualities of teaching are alterable through in-service education programs. As the quality to teaching becomes central, vis-a-vis the characteristics of the teacher, we will improve the educational process. We also will understand more about the variety of conditions and approaches that can serve to enhance teaching and learning. Tutors, aides, parents, and even other students can be helpful in promoting learning. New materials and media, new organization of classrooms, and new relations between teachers and students will be seen as important contributions to learning. Studies have found that when the interaction of teacher with student is altered, there is a significant improvement in student learning.

...Long Term Effects of
Mastery Learning...

Many of the major personality characteristics, interpersonal relation, values, ego, impulse control, aggression, and competiveness appear to develop during the early years in the home. They also change very little over time although their expression will change at different stages of development. For example, a woman is not likely to display aggression by hitting, as she was likely to do as a child, but by verbal means. Similarly, we may change the form in which we express our dependence or aggression, but the fundamental strength of these personality characteristics remain quite constant over most of our lives.

While appropriate therapy and major changes in the environment may bring about some changes, basic personality characteristics are almost impossible to alter under normal conditions. Clearly, schools have very little to do with changing basic personality. Recently, a number of investigators have studied changes in students that are in some way related to the school's "manifest and latent" curriculum. By "manifest curriculum" we mean the subject matter and objectives emphasized in the school. By the "latent curriculum," we mean the behaviors expected of school children such as punctuality, persistence, competitiveness, and the like.

These behaviors are the affective qualities related to learning in school. Of extreme importance is the fact that interest and attitudes toward school subjects, and school attendance is highly related to the student's sense of accomplishment or mastery of what is taught in the school. Interest and attitude appear to change rather quickly in relation to the student's perception of success or failure in the school. To do well in school results in a positive attitude toward learning. To do poorly in school results in a negative attitude toward school and school subjects.

Closely related to interests and attitudes is what has been termed the "locus of control," i.e., does the student feel he can exercise control over his destiny or does he feel that he is a weak individual who is being controlled by external forces or by chance events? Does the student say, "Did I answer the question correctly by luck?" or, "Did I answer that question correctly because I studied and worked at it?" Those who develop a notion of being controlled by chance or external forces are likely to be individuals who rarely have had a sense of success or achievement in school. In contrast, individuals who experience success in school come to believe that it is what they do that makes a difference. Such individuals are able to set goals for themselves, persist at difficult problems and, when they fail, have faith that they will succeed the next time around. Recently we did some research in the City Colleges of Chicago and found that students who reach high achievement develop a sense of being masters of their fate and not controlled by the ease or difficulty of a particular question on an exam or by luck.

...Success in School and
Self - Concept...

An individual's general self-concept (his feelings about himself academically) is also directly influenced by school achievement and by success and failure experiences. Such self-concepts are directly related to past school learning situations. Positive self-concept makes for excellence in learning and high motivation for learning, while negative self-concept results in poor learning and little motivation to overcome learning difficulties. All of us have learning difficulties at one time or another; however, it is a positive self-view that gives us the strength to fight and to find a solution. In research that my students are conducting, they find that these "affective cha-

racteristics" are highly related to positive mental health, while a negative self-concept is related to emotional difficulties. My students speak of the possibility that achievement over a number of years may immunize individuals against emotional illness. Psychotherapy is usually not very effective in changing these affective characteristics, but they can be changed with clear cut changes in the pattern of school achievement.

...Altering Our Basic Attitudes About Education...

Let me conclude by saying if we are convinced that little or nothing can be done to improve the learning of individual students, then our major effort must be invested in classifying children at a very early age and predicting later school achievement. This is what the SAT is all about. This is what the Binet and the Wechsler are all about. Our emphasis on stable variables in education can be partially explained by the fact that they are ideal for the purpose of classifying and predicting. Such efforts result in a school system that is quite effective for a small proportion of students while at the same time dooming most of the students to a deep sense on inadequacy and a dislike for school learning.

This explains why many countries end up with a very small proportion of students finishing secondary education. I know of one country that has the view that only 10 percent of the students can learn the high culture of that particular society. I have watched the way in which this highly developed nation fails students at each level so that by grade five, 80 percent of the students have repeated one, two or three years of school. They are, in effect, persuading 80 percent of their children by grade five that they cannot learn; they have little trouble getting rid of the others at later stages. I remember hearing the chief inspector of this country saying, "Our basic problem is how to get rid of most of the kids in the school system so that we can release the top five or ten percent to learn the great things that we want to teach them." I think we, perhaps, do it more humanely, but we still do it.

...Changes for School and Society...

If we are convinced that education is necessary for all who live in modern society, then we must search for the alterable variables that can make a difference in the learning of children and adults. Continuing our search for alterable variables will do much to explain learning and should lead to direct improvements in the teaching process. The small number of alterable variables I have discussed are only a few of those that have already been studied by researchers and used by teachers. They already have made a great difference in our understanding of school learning, but, also, they have brought about major changes in our views of learners and their amazing potential for learning. It is my hope that the items on this list will rapidly expand in the next decade and will become a central issue for teachers, parents, students, and researchers. When they are throughly understood and widely used, they will bring about the most profound changes in the school and in society.

REFERENCES

Bloom, Benjamin S. "The New Direction in Educational Research: Alterable Variables." Phi Delta Kappan, Vol. 61, No. 6, (February 1980).

Bloom, Benjamin S. Human Characteristics and School Learning. New York: McGraw-Hill Book Company, 1976.

Broudy, Harry. The Exemplars of the Teaching Method. Chicago: Rand McNally, 1965.

Carroll, John B. "A Model of School Learning." Teachers College Record, 1963, Vol. 64, pp. 723-733.

HISTORICAL PERSPECTIVES OF MASTERY LEARNING

By Dr. Rocco Caponigri

A summary of his comments at the conference

The revival of the mastery approach to learning owes much to the work of John Carroll, especially his 1963 article, "A Model of School Learning." Many first-time readers of Carroll's article in Columbia's Teacher's College Record immediately recognize the simplicity, uniqueness, and profundity of his concept: simple because it has only five variables; unique because all of the variables in the model are related to a single quantifiable variable, time; profound because it defined learners not as "good" or "bad" but as "fast and slow," and because it introduced the corollary that most students can learn what the schools have to teach if they have time and quality instruction.

...Carroll's Model...

Carroll's basic tenet is that the degree of learning of a particular learning task is a function of the ratio of the time the student spends learning to the time he needs to learn that task.

$$\text{Degree of Learning} = \frac{\text{Time Spent}}{\text{Time Needed}}$$

In turn, the time spent in learning is a function of the opportunity to learn and the student's perseverance. The time needed to learn is a function of the student's aptitude for that particular learning task, his ability to understand the instruction for the task, and the quality of the instruction he receives. Let us carefully define and explain our terms.

...Opportunity to Learn...

The opportunity to learn is defined as the kind of learning environment and the amount of time an institution makes available to the student.

...Perseverance...

Perseverance means "motivation." Perseverance is the amount of time the student spends in active learning. In turn, the more success students have with a learning task, the more likely they are to spend time and effort on similar or subsequent tasks later on. On the other hand, if they have always failed at learning, it is understandable why they fail to persevere.

...Ability to Understand Instruction...

The ability to understand instruction is the ability to understand the nature of the task to be learned and/or the procedure to be followed in learning that task.

...Aptitude...

In Carroll's model, aptitude is defined as the amount of time the student requires to attain mastery of a particular learning task. Here, Carroll makes a significant departure from the traditional definition of aptitude, i.e., of aptitude as a certain innate ability. One might be born with an aptitude for mathematics or an aptitude for art. If we use this traditional definition of aptitude, then individuals will either have the ability to learn a specific task or they will not. However, if we use Carroll's definition of aptitude, we don't classify our students as either able to learn or not able to learn. Instead, we classify students as slow learners and fast learners, and we can then adjust the learning experience accordingly. Simply stated, aptitude is a measure of learning rate.

...Bloom's Model...

Dr. Benjamin Bloom found in Carroll's model of learning a starting point for his own. Bloom's

model contains three interdependent variables: first, there is the extent to which the student has already learned the prerequisites of the learning to be accomplished. Bloom calls these the "cognitive prerequisites" of the learning task, and claims that variations in cognitive prerequisites account for 50% of the variance in final grades.

The second variable is the extent to which the student is motivated to engage in the learning process. Dr. Bloom calls this the"affective characteristics" of the student. He finds that affective characteristics account for 25% of the variance in final grades. Finally, there is the extent to which the mode of instruction is appropriate to the learner. This variable is generally labeled "quality of instruction;" it accounts for 25% of the variance in final grades. Collectively, these three factors account for about 90% (not 100% because of the interdependence of the variables) of the variation in final grades. Bloom's model may be depicted thus:

A student comes to a learning task with an established set of cognitive entry behaviors and affective entry behaviors. Thus, quality of instruction becomes crucial. The learning outcomes may be characterized as (a) the level and type of achievement, (b) the rate of learning, and (c) the affective outcomes associated with the learning. Using mastery learning strategies, we find that the rate of learning increases because, as the student gains the prerequisites, his aptitude for and his performance in that subject increases, thus improving his affective behavior as well.

...Cognitive Entry Behavior...

"Cognitive entry behavior" refers to the prerequisite knowledge, skills, and competencies that are essential to the learning of a particular new task or set of tasks. In terms of measurable variables, we assume that much of the variation in the learning of any particular task may be attributed to variation in the cognitive entry behaviors and the student's achievement prior to undertaking the new learning task. Most teachers believe that variations in the end product are due, at least in part, to the variations that existed from the beginning.

...Affective Entry Behavior...

When we talk about affective entry characteristics, we are asserting that individuals vary in what they are emotionally prepared to learn as expressed in their interests, attitudes, and self-concept. For a student to accomplish a learning task well, he should have an openness to the new task, some desire to learn it well, and sufficient confidence in himself to put forth the energy and resources necessary to overcome difficulties and obstacles. Many of our students, because of past experiences, don't believe that they can master their subject.

...Quality of Instruction...

Stripped to its essentials, "quality of instruction" involves the cues or directions that teachers provide to the learner, as well as the participation of the learner in the learning activities (whether covert or overt), and the feedback the learner receives. One of the key problems in the City Colleges of Chicago is getting students to participate. No matter what instructional strategy teachers use, students will not learn if they do not participate.

...Self-Concept...

A major influence on affective behavior is how students perceive their competence. Because grades, no matter how accurate or biased, are used as indicators of learning competence, most of the affective consequences we deal with are influenced directly by these measures of school achievement. Students' perceptions about their success or failure are more important than "objective" grades themselves. For this reason, teachers who are "easy markers" are deluding themselves, not their students, into a false sense of accomplishment. There is no such deceit possible in a mastery class. If a student is given an "A," it is because he has achieved the standard established at the beginning of the course.

...Minimal Changes in Classroom Routine...

As we further examine the theoretical basis for Mastery Learning and the methods for implementing the variables of Carroll's model, we will see that these are realistically accessible to educators. Implementing the mastery model is not likely to be resisted by faculty because only minimal changes of the usual classroom routine are required. Although elaborate preparations are necessary before one can begin to teach a class using Mastery Learning, none of the techniques are difficult to use or are unfamiliar to a traditionally trained teacher.

REFERENCES

Block, James H., and Anderson, Lorin W. Mastery Learning in Classroom Instruction. New York: Macmillan Publishing Co., Inc., 1975.

Bloom, Benjamin S. "The New Direction in Educational Research: Alterable Variables." Phi Delta Kappan, Vol. 61, No. 6, (February 1980).

Bloom, Benjamin S., Hastings, J. Thomas, and Madaus, George F. Handbook on Formative and Summative Evaluation of Student Learning. New York: McGraw-Hill Book Company. 1971.

Bloom, Benjamin S. Human Characteristics and School Learning. New York: McGraw-Hill Book Company, 1976.

Bloom, Benjamin S. "Learning for Mastery." Evaluation Comment. Los Angeles: UCLA, Center for the study of Evaluation of Instructional Programs, May 1968.

Broudy, Harry. The Exemplars of the Teaching Method. Chicago: Rand McNally, 1965.

Caponigri, Rocco S., et al. Mastery Learning Workbook. Los Angeles: UCLA (ERIC Clearinghouse for Junior College Information), 1981.

Carroll, John B. "A Model of School Learning." Teachers College Record, 1963, Vol. 64, pp. 723-733.

EVALUATION OF THE EFFECTIVENESS OF MASTERY LEARNING

By Dr. Thomas Guskey

A summary of his comments at the conference

Today I would like to address four very practical areas of Mastery Learning. These areas deal with the practical and personal concerns that administrators, instructors, and students often have with Mastery Learning.

First, I would like to describe what Mastery Learning means for teachers, as well as describe what issues administrators involved in Mastery Learning programs need to understand as they begin to implement this program.

Second, I would like to describe what Mastery Learning means for students.

Third, I would like to describe some of the common concerns that teachers have as they begin implementing Mastery Learning.

Finally, I would like to describe how a college might evaluate the effectiveness of its Mastery Learning program.

...Mastery Learning and Instructors...

For the past five years I have spent a great deal of time talking with administrators and teachers from a wide variety of educational institutions about Mastery Learning and about some of the instructional problems they face. What has impressed me most is that so many teachers face similar problems. I have consistently found that teachers are very much concerned with the quality of instruction they are able to provide. They want to do a good job. College teachers are very much concerned with helping their students to learn. These instructors are well aware that their students have different learning styles and that while one approach to instruction may be appropriate for some students in the class, it will not be appropriate for others. Teachers would thus like to provide more individualized instruction because each semester they are finding an increasingly wider variety of learners in each of their classes.

Most instructors are sensitive to the kinds of constraints found in the classroom. When they become involved in an individualized program, they understand that instruction has to be individually paced so that students can progress at their own pace. Typically, this means that the self-directed, fast learners will progress very quickly, while the less self-directed, slow learners fall further and further behind. This is a common problem found in many of the "Keller model" programs, often labeled "Personalized System of Instruction," the result being that a class finishes with a much broader spectrum of learners in terms of achievement than it had in the beginning.

...Management of Individualized Learning...

In addition, many of the individualized programs create serious management problems. When an instructor pays attention to one student, there are 30 others not being attended to. Furthermore, there is the problem of the course content. Usually, a certain amount of material must be covered by the end of the semester or students will not be prepared for what is to come in their next course. It is expected that this content be covered within the time limits of the course.

For a growing number of instructors in a wide variety of educational institutions across the country, Mastery Learning has solved many of these problems, and has provided a higher quality of instruction for students. Teachers have also been able to provide their students with more individualized instruction. Mastery Learning is certainly not an educational cure-all. It is not going to solve all our educational problems. But, I firmly believe it can be a very effective and very useful instructional tool for any instructor.

Mastery Learning is a teaching-learning strategy that can be adapted to a wide variety of teaching methodologies. In my work with school systems throughout the country, I have found that there can be tremendous flexibility in the applica-

tion of Mastery Learning. To some, Mastery Learning may appear to be "just good teaching." But, almost without exception, teachers who have worked with Mastery Learning have found it to be a very effective and powerful educational innovation.

...Materials For Mastery...

Since the conception of the theoretical ideas underlying Mastery Learning, two different approaches to its implementation have developed. These aproaches have been labeled the teacher-development approach and the curriculum-materials approach. Under the teacher-development approach, groups of instructors are brought together and trained in the theory and techniques of Mastery Learning. Then, individually or in teams, they work to develop the materials they will need to implement Mastery Learning in their classrooms. These materials usually consist of an organized plan which outlines the objectives of the teachers. Some people refer to this as an outline of learning objectives; Bloom uses the term "table of specifications." Formative tests, based upon specific learning objectives, are also prepared, as well as corrective activities that students can use as an aid in correcting learning difficulties. Finally, summative examinations are prepared in order to evaluate student learning. It is tremendously helpful if instructors work with other instructors in their field in order to develop these materials.

In the curriculum-materials approach, curriculum experts, subject area experts, writers, artists, and Mastery Learning experts are brought together to develop the packages of materials which are then distributed to instructors or teachers for use in implementing Mastery Learning in their classes.

...Teacher Development...

Here in the City Colleges of Chicago, Mastery Learning has been implemented by using the teacher-development approach. In the teacher-development approach, each individual instructor takes part in the process of organizing what is to be taught. Most instructors find this process very helpful. Teachers decide whether simple recall of information is sufficient or whether students must be able to apply their knowledge, or if they should be able to analyze different kinds of organizational processes, or synthesize these concepts in a new and meaningful way. The teacher development approach compels instructors to analyze what they will be teaching and to synchronize that material with their evaluation of student learning.

Through this process, instructors find that they are able to take the guess-work out of learning. If teachers set out to teach something, the effectiveness of their teaching is demonstrated by whether students have learned it or not. Through the teacher-development approach to implementing Mastery Learning, many instructors here in the CCC have been helped to become much more effective teachers.

The disadvantage to this appraoch is that large-scale implementation usually takes place at a very slow pace. It takes time to train individual instructors and to help them organize and develop the materials they will need to implement Mastery Learning. This is the advantage of the curriculum-materials approach. Once materials are developed, disseminations is very easy. Large-scale implementation can take place at a very rapid pace. The disadvantage to the curriculum-materials approach is that it lacks the personal involvement of the teacher-development approach.

Attempts are being made to combine these two approaches, taking advantage of the positive aspects of each. For example, here in Chicago a group of teachers from the Chicago Public Schools was brought together in a Mastery Learning workshop and helped to develop packages of materials they could use in implementing Mastery Learning in their classes. Later, a second group of high school teachers was brought together and given these materials, along with an explanation of how the materials had been developed. The teachers were then asked to revise these materials or adapt them to fit what they were doing in their classes. Both groups of teachers were then monitored over the next semester. Both groups of teachers were equally able to change student learning outcomes. When asked about specifics of the Mastery Learning process, the second group was not as clear or concise as the first (those who had gone through the more extensive training program), but their results were comparable.

...Mastery Learning and Students...

One of the most important elements in suc-

cessfully implementing Mastery Learning (particularly on the community college level) involves orienting students to Mastery Learning. Time and time again, students find it difficult to believe that they can learn and that they can do it well. Our students have had ten and twelve years of unsuccessful learning experiences behind them. They are convinced that learning is something they cannot do very well, and they often have lots of evidence to support their case. Surprisingly, even second and third graders often share similar perspectives. We do a very good job in most schools of letting students know who the fast learners are, who the slow learners are, and where they stand in that ranking. These perceptions are firmly established by the time students reach high school. Thus, at the community college leve, teachers have a very tough job in attempting to change these perceptions.

...Students' Self-Concept...

Let me tell you what I do in my classes. On the first day of class I begin by explaining the process of Mastery Learning to my students. I indicate that I am confident that every student can make a final grade of "A," and that I am one of the toughest graders in the college. I inform them that the class will not be easy but that they will be told exactly what they will need to do in order to succeed.

Throughout the course I continually review the Mastery Learning process with my students. I use a series of formative tests to provide my students with regular checks on their learning progress. These formative tests cover the concepts I have identified as important and provide both my students and me with feedback about their learning progress. I do not count these tests in grading my students. They are used primarily for diagnostic and prescriptive purposes. As you might guess, not surprisingly, students are unfamiliar with this kind of instructional process. After each item on the formative test, I indicate where that particular concept is discussed: specific page numbers in the text or workbook and what day I talked about that concept in class. Thus, my students know where to go for additional information on that specific concept, and with that information they are usually able to correct their learning difficulties.

Keep in mind, however, that this is only one way to use Mastery Learning. The application of Mastery Learning is very flexible, and I am convinced that there is no one best way! Instructors must adapt Mastery Learning strategies to their own instructional style and to the needs of their students.

When visiting schools across the country, I have often found two Mastery Learning teachers teaching the same subject at the same time of day to the same kinds of students with both teachers implementing Mastery Learning differently. The key here is that both teachers used the same common elements: group instruction, a diagnostic/prescriptive test, feedback and correctives, and a check on the success of the correctives--even though they may have applied these elements differently. Again: what works well for one teacher might not work as well for another. What is important is the underlying process and structure.

Let us now turn to some common concerns about Mastery Learning. One very common concern among teachers is: "What about this constraint of class time? I have a certain amount of course content which I must cover and you are telling me that I now must extend each learning unit to include this feedback and corrective process. How will I ever get through it all?"

...Orientations Essential...

Experience has shown that it is absolutely essential to use part of the first learning unit to orient students: to let them know that Mastery Learning is something different, with different expectations and methods of evaluation. In addition, it seems essential to take some class time during the first units to do some corrective work. Naturally, this means that the first units will take longer than usual. But as the term progresses, the amount of time required in each unit will decrease. As Bloom illustrated, when beginning any course of instruction, 56% to 70% of the work is "on-task," that is, directly related to course objectives. With Mastery Learning, students are "on task" for a greater percentage of time throughout the course, thus learning from the beginning of the term to the end. Thus, although Mastery Learning may require more time initially, it will require less time later on when everyone is familiar with the system. Most Mastery Learning teachers indicate that by the end of the term they can cover as much material as a class taught by traditional means.

...Are Bright Students Held Back?...

A second common concern that instructors often express is, "What about those fast learners? There are often students in my classes who are really bright. If I use Mastery Learning, am I holding them back? Am I not limiting what they can do in class?"

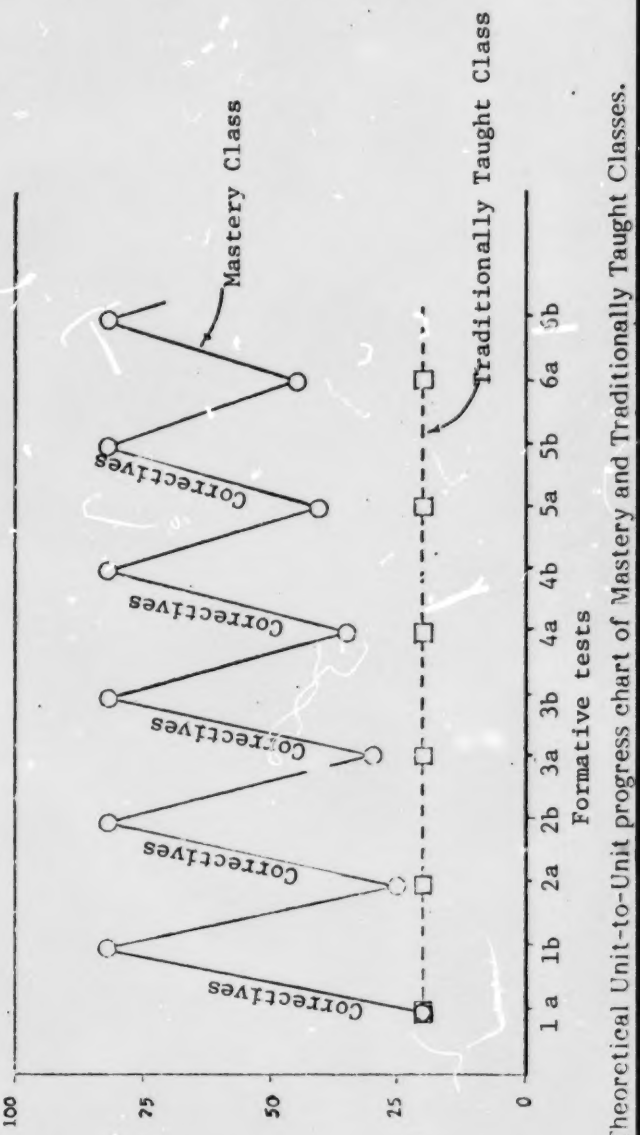
Consider what formative testing actually does. By going through the formative testing process and allowing fast learners to demonstrate that they have mastered the concepts on the first formative test, they can then be freed to pursue other kinds of activities that they would not have had a chance to pursue under more conventional types of instruction. In other words, they can do a special project or become involved in extension or enrichment activities. Without Mastery Learning, they would be sitting through review and re-teaching activities with everyone else. Often they can enrich their own knowledge by serving as tutors. Fast learners will continue to present a challenge to the instructor, but at the same time they are likely to have greater opportunities under Mastery Learning than they might have had under more traditional instruction.

A third common concern has to do with higher cognitive processes. "Mastery Learning seems to fit very well with instruction geared to the development of basic skills, but is it effective in teaching for divergent thinking skills, problem solving skills, and higher cognitive processes?"

We have found in case after case that Mastery Learning does work very well in courses designed to teach basic skills. But the successful application of Mastery Learning has not been limited to these courses. In many college courses, where instructors have focused their instruction on the development of higher cognitive skills, the Mastery Learning process has worked quite well. For example, Mastery Learning has been successfully applied in courses in counseling, composition, and political science. When the focus of instruction is upon these higher cognitive skills, instructors must strive to find ways to help their students practice and attain these skills. In this situation, our experience indicates that Mastery Learning can still be a very useful instructional tool. Again, this is due in part to the flexibility of Mastery Learning strategies. A theme or composition can certainly be used as a formative test so long as the instructor specifies the criteria for success so that students can correct their deficiencies and remediate their learning difficulties.

...Collecting Evaluation Evidence on Mastery Learning...

Let us now turn to the evaluation of a Mastery Learning program. First, teachers should probably chart the progress of the Mastery Learning class through the sequence of learning units. Often there is a chart in Mastery Learning classrooms which looks very much like figure 1.



Theoretical Unit-to-Unit progress chart of Mastery and Traditionally Taught Classes.

FIGURE 1

Regardless of how good the instruction is, it is likely that all students will not reach mastery on the first formative test. In fact, it is more common to find that the percent of students attaining mastery (85% correct on a test) is about the same as in any other class: around 30 percent. However, the critical element in the success of Mastery Learning comes between the first and second formative test, when correctives are introduced. By the second formative test, a large percent of students in the class (80% to 90%) should attain that 85% mark.

By the second unit, a few more students will have become familiar with the instructional format and know what to do to prepare for the formative tests. Hence, a few more students are likely to attain mastery on the first formative test for that unit.

Charts such as the one used here clearly show the progress made by students in a Mastery Learning class and how this progress is different from that in classes taugnt by more traditional strategies. In addition, a chart such as this often helps students see how Mastery Learning is working for them.

Second, teachers will need to gather information in order to make useful comparisons and evaluations. There are several ways to do this. One way is to ask each teacher involved in the Mastery Learning program to teach two sections of the same course, one section by whatever methods and procedures had been previously used, the other section by Mastery Learning. This is the procedure we followed in evaluating the CCC program. (See Guskey and Monsaas, Research In Higher Education, 1979), In this way, each teacher can conduct a firsthand mini-evaluation of the effectiveness of Mastery Learning.

Another way to get evidence on the effectiveness of Mastery Learning is to have instructors compare the achievement of past classes with present Mastery Learning classes. Since instructors often give the same or very similar final examinations, the average scores of students in both types of classes can be compared if, of course, the same grading standards are employed.

...Mastery vs. Non-Mastery...

Still another means of comparison is to match the results of Mastery Learning classes with similar traditional classes. Teachers should gather evidence, probably from a standard pre-test, to determine whether the students in each class are comparable at the beginning of the course. Then a common final examination or other type of standard achievement test can be used to assess the effectiveness of Mastery Learning instruction.

When evaluating Mastery Learning programs, teachers should collect at least two kinds of cognitive or achievement data:

1. Collect data on the formative tests to see how many students (what percent of the class) are reaching mastery and how many are not. This information can be used to judge the effectiveness of the initial instruction and the corrective activities. Specific revisions can then be made based upon this information.

2. Collect data on the summative examinations (i.e., the results on mid-terms and on final examinations) and try to compare the results with a control class.

Teachers may also want to construct a short questionnaire designed to determine how students feel about the subject and how confident they feel about themselves in learning activities. The questionnaires might simply include statements which can be rated from "strongly agree" to "strongly disagree," statements such as, "I feel I could do well in another course in this subject area," or "I am fairly confident of my ability in this subject." By administering this questionnaire both at the beginning and at the end of the course, teachers will be able to determine if there has been any change in these affective areas. If teachers write to me, I will be glad to send theme samples of instruments which I have developed for this purpose.

...Implementing A Mastery Learning Program...

Now, some considerations for beginning to implement a Mastery Learning program: we often make the mistake of trying to convince people to adopt a new educational innovation such as Mastery Learning by talking strictly about what it is going to mean for the students. Unfortunately, that is not always very effective. Before instructors can begin to evaluate what a new program is going to mean for their students, they must first resolve their individual personal concerns with regard to it. In my work I have found particularly

useful an implementation model developed at the University of Texas, which finds that concern over a new program or innovation follows three stages or levels:

1. Personal Concerns. When instructors first become aware of a new program, they may first wish to know more about it in order to discern how its use will affect them personally. They are likely to ask, "How much work is it going to be for me? How much time is it going to take? How much do I have to do that is different from what I am doing now?" It is only after these kinds of issues are resolved that instructors are ready to consider the next level of concerns.

2. Management Concerns. Having resolved individual personal concerns, instructors are now likely to ask, "How do I get Mastery Learning to work in my classroom? How can I best handle the feedback process? How do I motivate students to do the correctives?" After these issues are dealt with satisfactorily, instructors are then ready to consider a final level of concerns.

3. Impact Concerns. Instructors are now ready to consider how Mastery Learning is going to affect their students. The common questions now become, "What is Mastery Learning going to do for my students? What kind of results can I expect? How does what I am doing relate to what other Mastery Learning instructors do?"

Too often, when we begin the implementation of a Mastery Learning program, we focus solely on issues related to the program's impact, and we neglect individual personal concerns. My own research indicates that those personal concerns can never be fully resolved prior to involvement in a program. However, I do not believe that they can be completely neglected either.

My message is simply this: As teachers and administrators begin the implementation of a Mastery Learning program, they must not only keep their over-all goals in mind, but they must also be sensitive to the personal concerns of instructors who are going to be involved in the program.

Finally, let me mention what I believe is perhaps the most positive aspect of Mastery Learning. Mastery Learning implies a very important change in the instructor's role in the class. In more traditional instruction, learning is a very competitive activity. Students compete among themselves for the few scarce rewards (high grades) allotted by the instructor's "curve." Under these conditions, the instructor becomes a referee whose primary responsibility is to classify students. Under Mastery Learning, however, learning becomes a cooperative rather than a competitive endeavor. The students and the instructor are both on the same side, out to "master" what is to be learned, which means that helping another student to be successful will not be detrimental to the helping student. Grades are distributed in terms of what has been learned or mastered, not in terms of relative standing among classmates. Teachers must now be instructional leaders and learning facilitators working with students, rather than simply managers of the competition among students.

That is the challenge which lies before us!

REFERENCES

Guskey, Thomas R. and Monsaas, Judith A. "Mastery Learning: A Model for Academic Success in Urban Junior Colleges." Research in Higher Education, Vol. 11, No. 3, 1979.

FIRST DAY OF A MASTERY LEARNING CLASS

By Emmett Jones

A summary of his comments at the conference

I have been asked to tell you about how the Mastery Learning strategy is implemented in the classroom. I will limit my discussion to the first day of class, which I believe to be a critical point in the Mastery Learning process. It is the first day that sets the tone for the rest of the term. It is the beginning of the instructor's effort to change students' negative attitudes about their learning ability.

...Redirect Students' Attitudes...

On Day One of the semester I give the students an outline of the basic Mastery Learning concepts. I then ask them, "How many of you would like to make an "A" in this class?" Quite naturally everyone's hand goes up. I then say, "You are quite fortunate because every one gets an A in this class." I then proceed to tell them about the three views held by teachers regarding student achievement. I tell the students that there are some instructors who think of students as either good or bad, and that is reflected in the bell shaped curve. I spend ten to fifteen minutes explaining that some instructors, probably 80 percent, believe that some students are born with a high IQ and high aptitude and that this explains their high educational achievement, while other students have low IQ and low aptitude, which explains their low achievement. Then I go into Carroll's concept of the fast and slow learner and his belief that with time all students can learn. I tell them that Carroll gave us a new definition of aptitude which he defined as the amount of time it takes a student to complete a given learning task. Students who finish quickly are said to have a high aptitude for that task, and those who finish more slowly are said to have a low aptitude for that task.

...Given the Time All Students Can Learn...

My discussion then shifts to Bloom's work and how approximately 15 percent of all teachers have moved toward this view. Dr. Bloom says that we can all accept Carroll's notion that there are only fast and slow students instead of good and bad ones, and that all students can learn with time—but with one problem: time is limited by life. One may not live long enough to complete certain tasks. So Bloom asked, "What can I do to reduce the amount of time it takes to complete a given learning task?" He decided that before he could do that he had to find out what caused the variation in learning time in the first place, that is, the variation in the amount of time it takes to complete a learning task or the letter grade assigned after completing the task. Some students in the classroom may take ten minutes to complete a given task, while other students may take five. Some students may make an "A" and some students B's and some C's and some D's and some F's. So he put graduate students to work to explore what caused this variation.

...Prerequisites Essential...

The first finding was that 50 percent of the variation is due to the prerequisites that a student brings to a course, i.e., a student's history or experience with a particular subject area. I tell students that if it were possible for all students to get the same teachers; the same textbooks, and the same instruction, we could reduce the variability by 50 percent. Then the variance in time to master each new learning task could be reduced from ten minutes to five minutes.

...Feeling of Failure...

The second variable, "affective entry characteristics," accounts for another 25 percent. I define affect as the interest of students in a subject, their attitudes towards it, and their concept of their ability to learn it. Our students usually feel that they are going to fail. I let them know that we are going to work on making their "affect" more positive. I use the following

illustration to show the interrelation between cognitive entry behavior and affective entry behavior. A child from a very high socio-economic background (the father earns $80,000 annually) has a mother who can stay home and train her preschool child. She buys pencils and crayons and whatever educational materials the child needs.

In another home we have a child from a very low socio-economic background. There is no father in the home, the mother works ten or twelve hours a day, and there is very little money for educational materials. The two children are enrolled in the same school. On the first day of class, the teacher asks them to take out a sheet of paper and try to write out their name, address and telephone number. The child from the deprived background has likely never heard of an address or telephone number nor the fact that they can be written. I tell my students that the teacher is likely to say that the child is dumb. But, I explain, intelligence has nothing to do with this child's performance. The child simply does not have adequate cognitive entry behavior. If teachers accepted this fact, they could teach children what they need to know in order to perform these simple tasks.

The point of my illustration is that by the end of the first day at school the stage has been set for the remainder of this child's educational career. From the begining the child has been branded as dumb by his teacher, his peers, and his parents. By the end of the first year of elementary school, the child is unable to accept anything related to education--a lack of cognitive entry behavior has led to negative affect.

...Quality of Instruction...

The third variable I attempt to explain is "quality of instruction." I tell my students that 25 percent of the variation in classroom performance can be accounted for by the quality of instruction. I make it clear to my students that I have dedicated myself to making sure that everyone in the class understands everything that I have to teach. The point that I am trying to make is that students must understand what is being taught at the time it is being taught. I try to convince them that they will receive excellent instruction in my class.

After having explained the three variables accounting for the variations normally seen in classroom learning, we then discuss how we are going to proceed. I feel that it is important to tell students how the instructional course materials will be organized and presented. I discuss the concept of "sequential teaching units." I tell them that a teaching unit is simply a body of instructional material, such as a chapter in a textbook. A teaching unit is about eight to ten hours of instruction, or about two calendar weeks. Referring to my earlier discussion of cognitive entry behaviors, I explain that, because of their differing backgrounds, students can expect a wide variation in test performance on our first instructional unit. However, because students will take part in correctives after completion of the first unit, they should all be closer in grades in terms of the cognitive entry behavior required for the second unit.

When they take the test for unit two, they should not be surprised to find that a larger proportion of the class has done well. The overall performance of the class will improve with each succeeding task, while the variation among students decreases. I make it quite clear that they cannot possibly pass unit two unless they have mastered unit one, and they cannot expect to adequately master unit three unless they have learned unit two. After this admonition, I pass out the reading assignment sheets which are organized into sequentially ordered units. I let the students know that they don't have to go around guessing what we will do in the course, and I reinforce this statement with a complete set of objectives for the course. Each objective is arranged in teaching unit order. I review the objectives with the students, telling them that they should read the unit's objective (s) after they have completed the unit. If they feel they can do the things stated in the objective, they can rest assured that they have mastered the unit. At this point I inform the students that they will not be graded on the curve—they will have to meet predefined standards.

Fifteen years ago all of our biology teachers came together and analyzed the result of the examinations we had been giving. After this analysis (we established what we thought to be realistic grades for the range of scores), we reviewed our examinations. At our school we decided that any student who got 85% of the material correct warranted an A, 70% translated into a B, 50% was a C, 40% a D and anything

below 40% was an F. I strongly recommended that each teacher, or group of teachers responsible for the same subject, go through the process of setting standards and then using them for grading their summative evaluations.

For me, the most important part of the Mastery strategy is the formative or "diagnostic progress" test. On the first day I give every student a sample of a formative test. I tell them that if they miss a question they can go home and find the correct answer in their textbook by referring to the page number cited after each question on the test. I also give them a sample answer sheet that consists of two "answer" columns. When they take a formative test, they are to enter their answers in both columns of the answer sheet. After an examination they are to split the sheet into two halves, submitting one half to me while retaining the other half and the test questions for their own use during the corrective phase.

...Formative Tests...

In the classes I teach, I have divided the subject matter into ten units, and I have elected to give a summative examination at the end of the fifth and the tenth unit. Students are made aware of the fact that the two summative tests are the only ones that count toward their grade—the formatives given after each unit receive no weight in the final grade. It is important to spend the time to reassure the students that the instructional method used is not designed to separate the sheep from the goats; it is to assist them in learning and improving their attitude toward learning. The student must also be convinced that teachers are available to help them in any way possible, that every student is expected to make an A, and that they must begin to cooperate rather than compete. To facilitate cooperation, the students are asked to form small peer study groups and then to exchange telephone numbers and meet at each other's homes prior to the formative and summative exams. I then give my students an idea of what to expect in the day-to-day routine of the classroom.

If I am orienting a class that meets on Monday, Wednesday and Friday, and if it takes about two weeks to complete a unit, then if unit one is completed on a Wednesday, on that day they will be informed that a formative test will be given on Friday. They will be given a copy of the examination booklet and an answer sheet. They are told that they have 15 minutes to complete the exam. Upon completion of the exam, they are to split the answer sheet in half, give me one half, and retain the other half and the examination book for themselves. I spend some time answering and asking questions and clarifying any points until every question on the exam has been discussed. The students then grade their own papers. Those students who do not achieve 85% correct answers are told that they will have to retake a parallel exam on the following Monday. Students who have achieved mastery (85% correct) are told that they can come to class 15 minutes late on that day because the first fifteen minutes of the Monday class will be devoted to giving retakes. On that Monday we do not spend time clarifying concepts, but we examine the correct answers on the retake.

...Mastery Certificates...

Our Mastery Learning teachers have prepared special certificates that we distribute to the students who achieve mastery on a unit. Imagine how the students feel when they individually come forward to receive their certificates and the whole class applauds! It is probable that this is the first time that many of them have received any recognition for anything they have done. We have this little ceremony on the first unit only; on subsequent units I distribute the certificates to the students at their seats. We then spend a few minutes going over the correct answers; we do not spend time discussing concepts or entertaining questions.

Another activity we do on the first day of orientation is to clarify the difference between a formative exam and a retake. We explain that, although the two exams are similar in subject matter, they are not identical; therefore, students should not waste their time memorizing the questions on the initial exam hoping that they will appear on the retake—they won't. For example, on the initial exam I might ask students for the approximate number of neutrons in atoms having the symbol "Fe," and in the retake I might ask for "Md." I emphasize that it is the concepts they must learn.

...Students Responsible for Learning...

I would like to say a few words about my teaching style. I always try to emphasize that students are responsible for learning the material. I place the blame squarely on them if they fail to reach mastery after they have been given the correctives and the retake. I make sure that on day one my students understand that my standards are high and rather inflexible. I start my classes promptly on the hour. If a student is late for an exam, no additional time is allotted for completing the test. Absences may not exceed the number of time the class meets in a week (normally two). I only call roll once. If a student arrives after his name is called, he is marked absent. Students who exceed the maximum number of absences are asked to withdraw from the class. I always warn my students that we have severe snow storms in Chicago and if they have already taken their two days off because their toe nail hurts, they better sit on the ground and slide their way to class.

Also, if there are students who have not demonstrated mastery by the end of unit three on at least one of the initial or retake formatives, they are asked to leave. Many of you might find my methods a bit extreme for a college class, but they work for me. I usually start the semester with 30 students in a class; I always end up with at least 28. From my experience, if you provide guidance, students will do what is expected of them.

...Expected Results...

What kind of results can you expect from Mastery Learning? Let me present the data from my biology classes as an illustration: on the initial formative exam after unit one, I had 32 students. Of these, there were 8 A's, 7 B's, 11 C's, 4 D's, and 2 F's. Given these results, the 24 students not achieving an A had to return on the very next class session for a retake exam. The retake yielded 15 A's, 4 B's, 4C's (there were no D's or F's). Therefore, simply counting A's, 72% of the students achieved mastery at the end of unit one. The theory behind Mastery Learning would predict that, with each successive teaching unit, an ever-increasing percentage of students will achieve A's on initial formative exams and the variability among students will steadily decrease. My results support this theory. I began unit two with 31 students, and 18 achieved A's on the initial formative, thus demonstrating that a genuine improvement had taken place. Variability was also reduced because there was only one D and no F's. This improvement continued for the remainder of the course.

For me, this kind of dramatic improvement in the first few teaching units is common. Indeed, my experience shows that if there are no substantial gains by the end of the third unit, the remainder of the semester is likely to see only a small percentage of the students achieving mastery.

In summary, I have little doubt that those who adopt a Mastery Learning approach to teaching will find the ultimate result well worth the investment. Instructors must be willing to invest much effort in planning and preparing a Mastery Learning course in order to insure that the students have a clear sense of direction throughout the learning experience.

REFERENCES

Bloom, Benjamin S. Human Characteristics and School Learning. New York: McGraw-Hill Book Company, 1976.

Carroll, John B. "A Model of School Learning." Teachers College Record, 1963, Vol. 64, pp. 723-733.

Jones, Emmett L., et al. Mastery Learning: a strategy for academic success in a community college. Los Angeles: UCLA (ERIC Clearinghouse for Junior College Information), Topical Paper No. 53, December 1975.

WORKSHOPS: MASTERY LEARNING IN THE CLASSROOM

The conference workshops focused on the techniques of Mastery Learning and on the preparation of objectives, plans and materials necessary to implement Mastery Learning in the classroom. One of the plenary sessions was also devoted to practical issues. Emmett Jones discussed his technique for orienting his students to the Mastery Learning approach and for instilling in them a positive learning attitude beginning with the first day of class. (See p. 21). The teacher who never taught a class using Mastery Learning should find this section on the workshops invaluable, because in a few short pages all of the steps in the process are sequentially presented.

Below is a Schematic for Mastery Learning (Figure 1). It is a useful guide for teachers who are planning to implement Mastery Learning, because it outlines the basic steps which lead to the mastery of those learning units in the teacher's course outline.

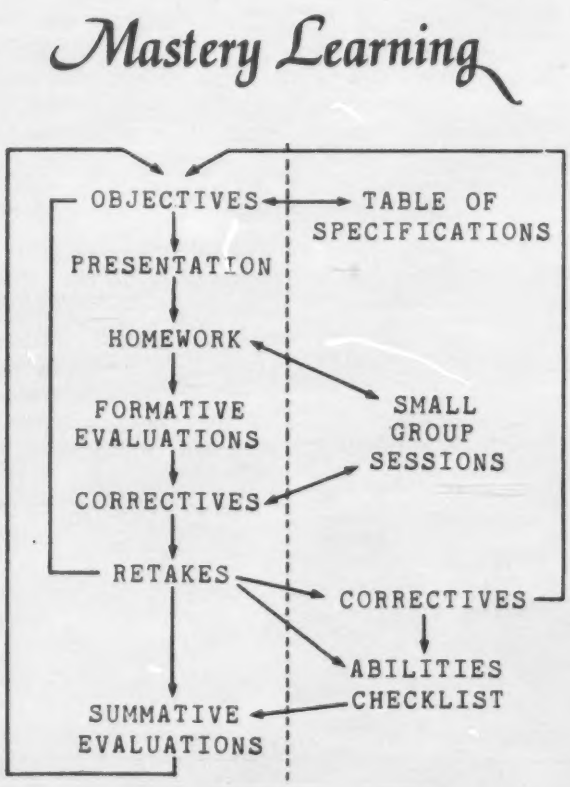


FIGURE 1

WORKSHOP I: TOPICAL OUTLINES

The teacher begins to organize a Mastery Learning course by first developing a topical outline for the class. The table of contents and the index of textbooks or other instructional materials are useful as sources in developing the outline. Each topic or sub-topic should be listed in the outline in the order in which it will be taught. This outline should reflect the teacher's own teaching style, the characteristics of the subject, and the pedagogical relationship among the various learning tasks. The following is an example:

TOPICAL OUTLINE

BIOLOGY 101

LOOP COLLEGE
ROBIN GALLAGHER, INSTRUCTOR

I. Introduction to the Study of Life

- A. The Characteristics of Life
- B. Diversity and Classification
- C. Life's Chemical and Physical Properties

II. Cell Structure and Organization

- A. Compounds Important to Life
- B. Internal Cell Structure
- C. Osmosis and Diffusion
- D. Active Transport
- E. Homeostasis

III. Cellular Use of Energy

- A. Nature of Energy
- B. Chlorophyll and Light Reactions of Photosynthesis
- C. Dark Reactions
- D. Cellular Respiration
- E. Metabolism
- F. ATP Formation

IV. Plant Form and Function

- A. Structure of Roots and Stems

B. Function of Roots and Stems
C. Structures and Function of Leaves
D. Food and Water Transport

V. The Human Organism-Circulatory and Digestive System

A. Circulatory System

1. Blood
2. Patterns of Circulation Vessels, Heart
3. Lympathic System
4. Immune Reactions

B. Digestive System
1. Structures
2. Physiology of Digestion
3. Pancreas and Liver-Hormone and Enzyme Control

VI. The Human Organism-Respiratory and Excretory System

A. Respiratory System

1. Structures
2. Role of Hemoglobin
3. Physiology of Gas Exchange - Lungs and Tissues

B. Excretory System
1. Structures
2. Hephron Structure
3. Physiology of Excretion

VII. Support Systems-Skeletal and Muscular Systems

A. Skeletal System

1. Exoskeleton
2. Endoskeleton

B. Muscular System

1. General Skeletal Muscle Structure
2. Types: Skeletal, Smooth, Cardiac
3. Membrane Physiology and Muscle

VIII. The Human Organism-Nervous System

A. Neuron Impulses, Reflex Arc
B. Brain and Spinal Cord
C. Nerve Transmission
D. Autonomic Nervous System
E. Sense Organs

WORKSHOP II: OBJECTIVES AND SPECIFICATIONS

...Preparing Instructional Objectives...

Stating objectives serves as the first step in the development of improved curriculum materials and instructional techniques. Objectives serve as guides to teachers and students alike.

There are three levels of specificity in stating goals and objectives: general aims for initial program planning goal statements for individual courses, and objectives for specific units and class periods.

...Tables of Specifications...

A Table of Specifications is a two dimensional matrix that relates the topics from the teacher's topical outline to levels of Bloom's Taxonomy of Educational Objectives. When constructing a Table of Specifications, the categories of Bloom's Taxonomy are listed across the top of the matrix. Then, the course content is listed under the appropriate taxonomic categories. If a particular topic at one level is a prerequisite for subsequent instruction at a more complex level, connecting lines are drawn to show the interrelationship between the two topics. For example, students are expected to have mastered the basic mathematical processes (e.g., adding, subtracting, multiplying and dividing) before attempting to solve more difficult algebraic equations.

...Setting Learning Objectives...

A Learning Objective is a statement describing an instructional outcome instead of an instructional process or procedure. It describes results, not the means of achieving those results. A course objective describes the desired outcome of the course. The objective tells what the learner's behavior will be as a result of the learning experience. Objectives should not be confused with course descriptions, which are designed to summarize the content and procedures of a course.

A usefully stated objective is one that succeeds in communicating a precise instructional intent to a reader. An objective is useful only to the extent that it corresponds to the concept its creator had in mind.

The best objective is one that excludes the greatest number of possible meanings.

WORDS OPEN TO MANY INTERPRETATIONS:	WORDS OPEN TO FEWER INTERPRETATIONS:
TO KNOW	TO WRITE
TO UNDERSTAND	TO RECITE
TO REALLY UNDERSTAND	TO IDENTIFY
TO APPRECIATE	TO SORT
TO FULLY APPRECIATE	TO SOLVE
TO GRASP THE SIGNIFICANCE OF	TO CONSTRUCT
TO ENJOY	TO BUILD
TO BELIEVE	TO COMPARE
TO HAVE FAITH IN	TO CONTRAST
TO INTERNALIZE	TO SMILE

In order to have an objective communicate a specified intent, an objective should clearly state what a learner is expected to do. An objective should describe the important conditions, if any, under which the performance is to occur. An objective precisely describes how well a learner must perform in order to receive a particular grade.

WORKSHOP III: FORMATIVE QUIZZES

Research on Mastery Learning strategies reveals that the two components most responible for making Mastery Learning successful are the use of feedback and the use of correctives.

Formative evaluations are diagnostic tools used to let teachers know what students have learned and what they need to study more thoroughly. Even though formatives are usually multiple choice paper and pencil quizzes, other approaches can be used. Usually one formative is given at the end of each unit, with test items based on that unit's Table of Specifications and list of objectives. The recommended order of the test items should be from simple to complex.

Formative quizzes do not count toward the student's grade. But, they are scored and returned to the students as soon as possible. By giving Certificates of Mastery or a similar recognition of mastery to students who meet the pre-determined level for mastery, the teacher can use the formative process to improve learners' academic self-concept.

WORKSHOP IV: CORRECTIVES

Correctives are introduced to provide alternative methods for communicating learning material to students and to provide additional time and practice where it is needed. Corrective processes enable students who have specific learning difficulties to overcome these difficulties. Generally, correctives are alternative learning experiences that help correct mistakes on the formative quizzes. In addition to meeting learning objectives for a particular unit, correctives also insure that all students have the prerequisites needed for the next units in the course. This increases the chances of successful learning on subsequent units. With proper use of correctives, the majority of students can master the course material.

...Individualizing Instruction...

Because no single instructional method is appropriate for all students, teachers can use a variety of correctives in order to meet individual student learning needs. Techniques such as alternate textbooks and small-group study sessions, workshops, flashcards, audio-visual aids, academic games, programmed instruction, tutoring, and Computer-Assisted Instruction are all useful as correctives. The teacher should include a minimum of one corrective procedure for each objective in the course. As time permits, the diversity in the types of correctives should be increased.

...Retake Tests...

"Retake tests" are diagnostic tools that parallel the formative quizzes to determine if the correctives have helped the student remedy the deficiencies revealed by the formative. "Parallel" does not mean that the items on the retakes are identical to the items on the corresponding formatives but that the items are related to the same objective. Because each formative test item was written to assess the accomplishment of a specific

unit objective, the teacher should make sure that retake test items also assess mastery of the same objectives. The retake test items should also assess behavior at the same taxonomic level as the original formative test items and the unit objectives.

WORKSHOP V: SUMMATIVE EVALUATIONS

The final step in the development of a teacher's Mastery Learning course is the development of Summative Evaluations. The formative evaluation instruments developed for each unit in a course are designed to assess the degree of student learning of specific learning tasks and the effectiveness of instruction. Formative evaluation provides data on how students are changing. Summative evaluation is concerned with how students have changed - primarily by appraising the extent to which students have attained the course objectives. Summative evaluations are commonly used as midterm and final examinations.

The primary use of summative evaluation is to assign grades. However, summative evaluations can also be used for certification of skills and abilities, for prediction of success in a subsequent course, for determination of the initiation point of instruction in a subsequent course, for feedback to students, and for comparison of outcomes of different groups. The construction of summative evaluation is influenced by the particular purpose of those evaluations; therefore, it is important for the teacher to determine how the evaluations are to be used before actually beginning to construct a summative instrument.

Summative evaluations are similar to most traditional testing instruments. However, a major difference between traditional evaluation instruments and summative evaluation in Mastery Learning is that traditional testing instruments are norm-referenced (that is, graded on a curve), whereas summative evaluation tests are criterion-referenced (graded on an objective level of performance).

REFERENCES

Block, James H. (Ed.). Mastery Learning. New York: Holt, Rinehart and Winston, Inc., 1971.

Block, James H., and Anderson, Lorin W. Mastery Learning in Classroom Instruction. New York: Macmillan Publishing Co., Inc., 1975.

Bloom, Benjamin S., Hastings, J. Thomas, and Madaus, George F. Handbook on Formative and Summative Evaluation of Student Learning. New York: McGraw-Hill Book Company. 1971.

Bloom, Benjamin S. (Ed.). Taxonomy of Educational Objectives Handbook 1: Cognitive Domain.

Caponigri, Rocco S., et al. Mastery Learning Workbook. Los Angeles: UCLA (ERIC Clearinghouse for Junior College Information), 1981.

Gronlund, Norman E. Stating Behavioral Objectives for Classroom Instruction. New York: The Macmillan Company, 1970.

THE DEVELOPMENT OF A LARGE-SCALE MASTERY LEARNING PROGRAM IN A COMMUNITY COLLEGE SYSTEM

By Dr. Rocco S. Caponigri

A summary of his comments at the conference

The City Colleges of Chicago (CCC), a multi-campus institution serving some 110,000 full-time and part-time students, faces problems similar to those that confront all big city community colleges: declining enrollments in transfer programs, declining academic standards, an increasing number of poorly prepared students, increasing drop-out rates, skyrocketing costs, and declining faculty morale.

...The City Colleges of Chicago...

The City Colleges of Chicago, a system of nine community colleges, offers non-traditional as well as transfer and career programs and pre-college courses. Transfer and career programs are available at Daley College, Kennedy-King College, Loop College, Malcolm X College, Olive-Harvey College, Truman College and Wright College. The Chicago City-Wide College (CCWC) provides non-traditional instructional delivery systems using television, radio, newspaper and audio and video cassettes in public libraries; classes overseas for servicemen; programs for the handicapped; health institutes programs including paramedic classes; human services such as child care programs; public services serving police, fire and other governmental employees enrolled in college credit classes; college credit by examination and the College Acceleration Program for high school seniors. CCWC also develops and maintains educational programs throughout the city and provides staff development programs for faculty and staff from other colleges in the system. The Mastery Learning program, with headquarters at CCWC, serves faculty throughout the system. The ninth operation, the Chicago Urban Skills Institute, serves 38,000 persons at 23 adult evening high schools, two vocational-technical centers and 500 outposts that provide English as a Second Language and General Educational Development (G.E.D.) classes where extensive developmental programs are featured.

The "typical" CCC student is a black woman in her mid-twenties who works, maintains a home, and attends school part-time. Approximately 57% of CCC students are black, 28% are white, 6% Hispanic, and the remainder are other minorities. Excluding CUSI and adult education programs, about 58% of our students are part-time, 54% are female, and 33% receive some form of financial aid. Again, excluding CUSI, the full-time (15 credit hours) enrollment is approximately 42,000.

...Committed to Open Enrollment...

Because the City Colleges of Chicago is committed to open enrollment, it enrolls many students who are poorly prepared for college level work and have poor attitudes toward learning. Our students often come to us without the basic skills needed to successfully complete courses that are traditionally at the beginning of a college curriculum. Given these conditions, many CCC faculty and administrators saw the need for new methods of instruction, especially the need for individual instruction, all within the confines of the traditional classroom setting and semester. Dr. Bloom's approach seemed to offer an answer. The City Colleges of Chicago now uses Mastery Learning as a workable means of individualizing instruction within the traditional classroom setting.

Although it seems clear that this technique could ameliorate some of the problems of CCC, research on Mastery Learning in community colleges was usually conducted on a small scale and, though Mastery Learning proved successful where tested, questions remained. Could Mastery Learning be institutionalized? Could Mastery Learning be implemented on a large scale? How would a student's achievement be affected if his or her entire schedule consisted solely of Mastery classes? What impact would such a curriculum have on academic standards, enrollment, attrition rates

and faculty morale? Would it be cost effective? The CCC Project seeks to answer these questions as well as identify other issues that are pertinent to Mastery Learning Theory and practice at the community college level.

...Mastery Learning on a Large Scale...

The Mastery Learning Project at CCC can be divided into four phases, with the first phase covering the years 1972 to 1975. Although Mastery Learning techniques have been developed and utilized by individual instructors throughout the system since 1969, it wasn't until 1972 and the influx of federal funds under Title III of the 1964 Higher Educational Act, that a unified effort began. The program began in the 1972-1973 semester, when four faculty members used Mastery Learning in their classes. In 1973-1974, nine new faculty members were added, and in 1974-1975, seven more were added. In this first phase, Mastery Learning was used at only one college, in the following disciplines: accounting, architecture, black studies, chemistry, economics, electronics, English, foreign language, humanities, nursing, social sciences, and speech. Because of the positive results of this early work in Mastery Learning, the Central Administration decided to expand the Mastery Learning program by introducing it to the other city colleges. This decision marked the beginning of Phase II.

In the spring of 1976, about 80 CCC instructors responded to an invitation to attend a special seminar in Mastery Learning held at the University of Chicago where Professor Bloom would explain the theory and application of Mastery Learning. Instructors were divided into groups according to their subject area: biology, counseling, English composition, history, mathematics, nursing, psychology, reading and Spanish. Instructors then worked in these groups to develop formative test items, correctives, and summative test items for use in their subjects. During the 1976-1977 academic year the Mastery Learning Project included 2,211 students in 77 classes taught by 37 instructors. During Phase II, efforts were focused on answering two key questions: Are Mastery Learning strategies more successful in improving student performance and in reducing attrition than non-mastery techniques? Is Mastery Learning equally successful in all subject areas?

...Mastery Versus Traditional Techniques...

Faculty who participated in this phase of the project were asked to teach another section employing the technique they traditionally used. When teachers compared their traditional class to the Mastery Learning class or classes, they found that Mastery Learning increased both achievement and retention.

Encouraged by the success of the first two phases of the Mastery Learning Project, the CCC Central Administration decided to offer another workshop during the summer of 1977 under the auspices of the Center for Instructional and Staff Development of City-Wide College. This increasing adminstrative commitment toward efforts to institutionalize the Mastery Learning strategy marked the beginning of Phase III of the Project. Thirty-five additional faculty members participated in this workshop, resulting in the addition of 27 courses and 892 students to the project. Added also were these disciplines: accounting, business mathematics, child development, electronics, English grammar, geography, history, humanities, music, nursing, physical science, psychology, science, shorthand, Spanish, sociology, and typing. Also, in order to help faculty cope with the vast amounts of work involved and to more closely monitor student progress, the project provided each teacher with a Mastery Learning Manager.

...Administrative Support for Mastery Learning...

The first three phases of the Mastery Learning Project focused on introducing Mastery Learning to CCC faculty. Phase IV, the current step in the Project's development, is characterized by a strong administrative commitment and an established structure for the (day-to-day) management of the Project. Phase IV began in the fall of 1977 with 120 teachers teaching 187 courses. This phase was introduced to answer the question: Can Mastery Learning be institutionalized? We wanted to know if a sufficient number of teachers could be encouraged to use Mastery Learning so that students could select Mastery Learning courses in a variety of subjects and at various times. We especially wanted to see whether Mastery Learning, which requires extra time and effort, would be widely accepted by veteran faculty members fairly set in their ways.

Today, each college appoints a faculty member to act as coordinator for Mastery Learning activities. The coordinator oversees the training of Mastery Learning Managers (see below) and their assignment to mastery teachers. The Center for Faculty and Staff Development of City-Wide College, with the support of the CCC and CCWC administrations, assists the program by collecting and analyzing data from the program, by assisting further research, by training new mastery teachers, and by supporting the publication of a Mastery Learning newsletter. The Center has also established a Mastery Learning Library.

The Center promotes the further adoption and utilization of Mastery Learning by continuing to conduct workshops to help teachers understand its techniques. To encourage teachers to attend these workshops and to try Mastery Learning in their classes, as well as to recognize the amount of work required to learn about and use Mastery Learning, the CCC administration grants faculty members credit that can help advance them to a higher salary lane. Workshop participants are required to develop a set of Mastery Learning materials and implement their Mastery Learning strategy in the classroom in at least one course for one semester.

In 1979, Mastery Learning faculty and staff, through the Center for Faculty and Staff Development, assembled The Mastery Learning Workbook. This workbook helps teachers develop materials for their Mastery Learning classes. In addition, the Workbook contains a brief overview of the theoretical aspects of each component of Mastery Learning (table of specifications, formative tests, correctives, etc.) The Workbook consists of 10 units, and, typically, each unit is covered in a single three-hour workshop session. A participant is expected to begin the development of one of the component materials required for a mastery course in the workshop session and complete that component at home before the next session. To accommodate our faculty, workshops are conducted during an intense, two-week, summer session, as well as during ten, three-hour sessions spread over a single semester.

...Mastery Learning Managers...

The program has been helped immensely by the addition of Mastery Learning Managers: CETA (Comprehensive Employment and Training Act) personnel utilized as para-professionals by Mastery Learning teachers. These Managers have been instrumental in improving students' attitudes toward studying and learning, mostly by supporting the students' academic efforts and by appearing more accessible and less threatening than the teacher. A Mastery Learning Manager:

1. Arranges a weekly work schedule with his or her Mastery Learning teacher.
2. Attends all local and central Mastery Learning meetings.
3. Attends every class in order to provide the teacher with feedback on the progress of the class, to support the teacher's strategy, and to provide information to the students.
4. Tutors students as needed.
5. Organizes, schedules and monitors small group sessions.
6. Monitors the corrective phase of the Mastery Learning technique.
7. Contacts, by telephone or mail, all students absent from class.
8. Administers formatives and retakes to students absent from class.
9. Keeps daily non-official attendance records.
10. Keeps records of formative and summative evaluations.
11. Assists the teacher with typing and other clerical needs.
12. Develops quiz items and correctives at the request and with the guidance of the teacher.
13. Performs other related duties as assigned by the teacher.

Since Mastery Learning Manager performs much of the clerical work, the teacher is free to spend more time with individual students. The Mastery Learning Manager also contributes directly to the individualization of instruction by advising the student on which of the alternative learning experiences to use.

...Peer Tutoring In Small Group Sessions...

In a Mastery Learning class, each student is assigned to a group of three to five of his fellow students. The prime purpose of this group is to permit students to help each other with the correctives. Every student in class must meet with his group for 20-30 minutes either before or after each class. The Mastery Learning Manager monitors these groups and acts as a resource person. Research at the University of Chicago plus our own experience has shown this form of peer tutoring to be very effective. The manager can also provide valuable feedback to the student during the formative-corrective-retake cycle. Also, by contacting absentee students in a positive manner, the manager helps them keep up with the class. Many instructors observe that these activities make students feel more confidence about their ability to learn. In turn, this improved attitude has a positive effect on the students' actual performance.

...Future Research and Activities...

Mastery Learning has been implemented in the City Colleges with varying degrees of success. At this point we judge the Project to be a modest success. The bulk of future research will be concerned with the effects on student achievement of a curriculum composed solely (or, at least largely) of mastery classes. Also, we are interested in determining whether Mastery Learning helps students "learn how to learn." Research in these last two areas has already begun. With funding provided by a United States Department of Health and Human Services Special Services for Disadvantaged Students Grant, we will conduct a one-year study of 350 students enrolled in more than one mastery class. In the near future we hope to :

1. Provide more in-service training opportunities to increase the number of teachers using Mastery Learning.
2. Develop valid and reliable evaluation measures to identify the successful teachers.
3. Study, in depth, the techniques used by these successful teachers.
4. Communicate to faculty the techniques used by these teachers.
5. Develop and maintain a library of materials to be used by faculty members developing Mastery Learning courses.
6. Improve the quality of paraprofessional support by conducting in-service training for Mastery Learning Managers.
7. Encourage and provide assistance to faculty in the use of media in the corrective phase of Mastery Learning.
8. Study the effect of Mastery Learning on the attitudes of students toward school.
9. Continue to compare student performance in both mastery and traditional classes.

...Mastery Learning in the Community Colleges: Concluding Comments...

Our experience has shown that Mastery Learning can be successful at the community college level. In summary:

1. Students should fully participate in the Mastery Learning process in order to obtain maximum benefit from it. Participation in the formative-corrective-retake cycle is especially vital. From data we have collected and from our own experience we believe that if a student participates in the process, there is an 85 percent chance that he will receive an A or B and will be better prepared to take subsequent courses.
2. As individual teachers become more familiar with Mastery techniques, the performance of their students improves.
3. Mastery techniques have shown to be effective in most subject areas. In 64 percent of the comparisons of Mastery Learning vs. traditionally taught subjects, attrition was lower for the Mastery subjects and student performance was superior in 68 percent of the comparisons. As teachers perfect and personalize their approach to Mastery, these figures should approach 80 to 90 percent.

4. We believe that continuing to encourage teachers to develop their own Mastery techniques, rather than requiring a strict adherence to a prescribed format, will speed the adoption of Mastery Learning in the City Colleges of Chicago.

5. Students in Mastery classes often undergo a positive change in attitude toward themselves as learners and toward their subjects.

...Mastery Learning
Not A Panacea...

Although many questions remain regarding the institutionalization of Mastery Learning, the fact remains that teachers using the Mastery Learning approach can virtually guarantee success to students who engage in the process. Mastery Learning has never been viewed as a panacea. However, if the technique can be institutionalized, it will have a positive impact on high attrition rates and on low student achievement.

REFERENCES

Caponigri, Rocco S., et al. Mastery Learning Workbook. Los Angeles: UCLA (ERIC Clearinghouse for Junior College Information), 1981.

Caponigri, Rocco S. and Schumann, M. Robert. Mastery Learning in the City Colleges of Chicago: 1972-1979. 1980. Available from the authors.

Jones, Emmett L., et al. Mastery Learning: a strategy for academic success in a community college. Los Angeles: UCLA (ERIC Clearinghouse for Junior College Information), Topical Paper No. 53, December 1975.

ADMINISTRATIVE ASPECT OF MASTERY LEARNING

By Dr. Hymen M. Chausow

A summary of his comments at the conference

For me, the most important administrative aspect of Mastery Learning is not the method itself but it philosophical basis: that one can learn. Administrators must continually transmit this philosophy to the faculty: our students can learn.

Following a presentation Dr. Bloom recently made in Chicago, representatives from the business community and teachers' unions became interested in Mastery Learning. One of the business leaders told educational, business, and government leaders in New York about Dr. Bloom's ideas. The New York school board and administration became interested in and eventually established a Mastery Learning Program in New York City's schools. Many local New York school administrators wisely took advantage of the program. They exercised leadership and began a program which undoubtedly will have a positive impact on both students and teachers, for as both teachers and students perceive this positive support, I believe their morale, interest and efforts will improve.

...Teacher as a Professional...

When I asked Dr. Bloom how he persuaded the New York Teachers' Union to adopt Mastery Learning as a high priority, he replied that he was told that a business leader drew this analogy: Whenever one goes to a hospital, the chief person in that hospital is the doctor. Hospital administrators have long recognized the role of the doctor and, together with their staffs, totally support his needs. His patients respect him. He is a professional. Why can't we do this in education? Why can't we make the teacher the doctor and thus the respected and fully supported professional? For teachers to be considered in the same manner as the doctors, that is, as professionals, they too must be able to provide some help, alleviate some fears, and perform some cures for their students. The administration, instead of spending time and effort "controlling" the faculty, could, like hospital administrators, devote that time supporting teachers in achieving results. Success through Mastery Learning is one way teachers can demonstrate that students can learn. If faculty members do not believe students can learn, regardless of what pedagogical method is used, then neither the teachers nor the students will be successful.

Needless to say, the President of the Teachers' Union strongly endorsed this positive stance for professionalism and the concept of Mastery Learning.

...Decreasing Enrollments...

Another important administrative concern that I and other educational administrators must address is the problem of decreasing enrollments in certain areas. In response to this problem, City Colleges of Chicago faculty and staff have strongly requested a major recruitment program. Our classes would then again be filled, they insist, and our troubles would be over. However, recruitment is really not the solution. Based on data I have collected, CCC has several colleges with a very high enrollment as well as a high dropout rate. We seem to be able to get students in, but they get out nearly as fast.

...Successful Teachers Care...

As I began to work on this problem, I looked through our colleges for faculty members who, in the most recently completed semester, had taught classes in which at least 90 percent of the students received passing grades and at least 90 percent of the students had been retained for the entire semester. I discovered that approximately 15 percent of our total faculty had students in this category. Because I believed that we could learn

from this valuable resource of "successful" teachers, I met with a small group of them for an informal discussion. When I asked them, "How did you do it?" I learned that there were four elements that were common to the success of all these teachers.

First, these teachers cared about their students. How did I know that? Because each of them was able to call their students by their names within the first couple of class sessions. That, to me, is a valid criterion of caring. I had always believed that successful teachers dealt with absenteeism by telephoning their students at home to determine what their problems were. Surprisingly, what I found was that my group of successful teachers, in addition to telephoning students, carefully identified friendship groups. Members of the group were asked to tell absent students that the teacher was concerned and was willing to discuss any problems they were having with the course. Can you imagine the impact on absent students when they heard their friends tell them that the teacher was asking about them?

...Performance Criteria...

Second, using a technique of Mastery Learning, these successful teachers let the students know what was expected of them. The students knew the course objectives, knew the level of competence they were expected to achieve, and they were given clear information on how to achieve the objectives. Also, the teachers strove to adapt general instructional materials to meet the individual needs of the students in the class. This flexibility, coupled with the students' knowledge of what was expected, was a major contributor to the teachers' success.

...Sequential Development...

Third, these teachers expected their students to practice the behavior associated with the objectives of the course. Fourth, I learned that, in almost all of the cases, the successful teachers organized their material in a sequence of continuous practice, feedback and evaluation.

...Tyler Rationale...

Much of what I learned in these discussions came close to the educational rationale of Ralph Tyler of the University of Chicago. Tyler has outlined four steps in the instructional process:

1. Determine your objectives
2. Specify the relevant learning experiences
3. Organize the learning experiences to maximize continuity and insure sequential development
4. Evaluate progress

When I was a young teacher, I thought I must rigidly adhere to Tyler's sequences, i.e., I must first set my objectives before moving on to define the learning experiences, etc. I have since learned that a teacher can start the sequence at any point in the cycle, or wherever the need is greatest. For example, if a teacher evaluates the progress of a class and he is dissatisfied with the results, he can go back and look at the objectives, and then shift his focus to the quality of the learning experience his students received. I found that it is not important where one starts--just that one starts!

Throughout this conference and throughout the Mastery Learning literature, we find the discussion of whether the normal curve is the best representation of the effects of the learning process. For Bloom and Mastery Learning adherents, the normal curve has come to symbolize the ineffectiveness of our educational system. I, too, share this view. To me, the exalted position the bell-shaped curve enjoys in education is not only unwarranted but inherently invalid.

...Normal Curve
In Effectiveness...

The bell curve occurs mostly by chance, which is not an acceptable criterion. Education is purposeful and, therefore, ideally represented by a final skewed distribution. If we have done our work well, students should cluster at the top of the distribution, not at the center, as so many of us have been taught to believe, or at the bottom, as too often occurs. The skewed distribution, with its tail shifted to the right, is a much more appropriate construct for us to deify. Although a much more demanding and unforgiving god, it also is one that is infinitely more rewarding. Thus, if a

teacher doesn't organize course materials in order to help students learn, then when they are tested, they will show little progress. If, however, the teacher provides the necessary supportive services and correctives, it is then possible for 80% to succeed instead of 20%.

...Educational Alternatives...

We must continue to find ways to provide more effective instruction. One effective corrective aid is PLATO, or instruction by computer. By using PLATO, many students can participate in a system that is both fun and instructive, a system that provides an individual method for achieving the objectives of a lesson. The use of video cassettes is another corrective we have begun to use and hope to expand. Programmed learning is another corrective technique. For example, in our Humanities 202 course, a study guide prepared for the TV course used a "branching" type of programmed learning. The student was first assigned a chapter in Aristotle's Ethics. After reading the chapter, he was directed to the study guide. Aristotle, in this chapter, wrote about "good" or "goodness". "What," the student wondered, "did he mean? How shall I answer the question on this issue in the study guide? Is the answer A, B, or C?" The student decided the answer was C. The study guide directed the student (or any student giving the C response) to turn to page 12. Page 12 read, "If Aristotle really meant. . . why did he . . " (Additional information is given the student.) After receiving this information, the student was directed to return to the original question, and he then realized that the correct answer was A. The study guide further reinforced the student's response with, "You are right," and the student was given further supporting material. The importance of this example is that a teacher used this same material in a class of disadvantaged students and reported he had never before experienced such a positive response.

Another teacher assigned a theme a week to fifty students in two sections of the course. Instead of marking each paper with the usual red ink pen, which is supposed to call the student's attention to his errors (and seldom does), he graded each paper by dictating suggestions for improvement and usage corrections on individual discs which each student could hear on a phonograph either at home or in the library. No red marks! Instead, individualized, meaningful attention. All fifty students completed the course! It is possible.

All City Colleges now have a Mastery Learning Coordinator, a faculty member who has received Mastery Learning training. Grant money has enabled us to hire managers and tutors to assist Mastery Learning faculty. Some eighty or more managers from CETA, Comprehensive Education Training Act, serve as tutors and work with Mastery Learning Coordinators to further support the Mastery Learning teacher. (Dr. Bloom calls this the "Mother Hen Approach".) The managers also give the re-tests and relieve the teacher of making follow-up phone calls.

Yesterday, the Chancellor and I met with Dr. Bloom, who said, "It's time to go beyond Mastery Learning. Let's get other community colleges to join with us to develop a national instructional research and development center." Using this and other ideas, we will strive to find solutions to problems that confront community colleges all over the nation. When I questioned Dr. Bloom about block programming high-risk students and asked how many courses could a student simultaneously take in Mastery Learning, he answered, "I don't know." To find an answer to that questions is the kind of activity the Center will undertake, and I look forward to the not too distant future when I can give a full report on a fully operational Center.

Perhaps I should conclude my comments on the administrative aspects of Mastery Learning by reminding you that not only can students learn, faculty and administrators can learn as well. Administrators have learned that it is their responsibility to create a professional environment in which both teachers and students can succeed together.

REFERENCES

Bloom, Benjamin S. Human Characteristics and School Learning. New York: McGraw-Hill Book Company, 1976.

Tyler, Ralph W. Basic Principles of Curriculum and Instruction. Chicago: The University of Chicago Press, 1949.

SPEAKERS

BENJAMIN S. BLOOM is a Distinguished Service Professor of Education at the University of Chicago. He is author and co-author of a number of major books, including Human Characteristics and School Learning, Taxonomy of Educational Objectives, Handbook on Formative and Summative Evaluation of Student Learning, and his latest work, All Our Children Learning, to be published this year. Dr. Bloom is one of the leading proponents of Mastery Learning and has been a valuable resource in introducing Mastery Learning in the City Colleges of Chicago.

ROCCO S. CAPONIGRI, Director of the Mastery Learning Project at City Colleges of Chicago, began his research into mastery techniques in 1969. His doctoral dissertation at Loyola University of Chicago, "Capsulized Mastery Learning," was an early contribution to the research literature on the subject. Dr. Caponigri has also successfully used Mastery Learning in the classroom while teaching mathematics at Loop College. He is presently conducting workshops for faculty as well as directing several research projects.

HYMEN M. CHAUSOW, Senior Vice Chancellor for Faculty and Instruction of the City Colleges of Chicago, has been a long-time supporter of Mastery Learning as well as other innovative programs. Dr. Chausow, who received his doctoral degree from the University of Chicago, began his career with City Colleges as an instructor of Social Sciences. He has also served as the Dean of TV College and has published a number of articles.

THOMAS R. GUSKEY is the Director of the Office of Educational Research at the University of Kentucky. He received his Ph.D. from the University of Chicago where he worked closely with Dr. Bloom and served as Director of Research and Development for Chicago Public Schools and as Special Consultant to the City Colleges of Chicago on the development of Mastery Learning programs. He is the author of numerous articles on the theory and application of Mastery Learning and works with universities and school systems across the nation on the development of programs incorporating these strategies.

EMMETT L. JONES is Professor of Biology at Olive-Harvey College. He received his Master's degree from the University of Detroit and has been active in Mastery Learning since 1972. Mr. Jones directed the Mastery Learning Project at City Colleges of Chicago from 1976 to 1978. He has conducted a number of workshops on the subject as well as served as a consultant. He also co-authored ERIC Topical Paper 53, Mastery Learning: A Strategy for Academic Success in a Community College.

WORKSHOP LEADERS

DON BARSHIS, Dean of Faculty-Staff Development, Chicago City-Wide College, taught English and reading for twelve years at Loop College. While there, he developed and directed the Individual Needs (IN) Program, an academic/support service program for high-risk students. Barshis holds a Master's degree from the University of Wisconsin and is completing his doctorate at the University of Chicago. He has a communication textbook accepted for publication by Aldine Publications.

ROSALIND COX, mathematics instructor at Malcolm X College, will be adapting the Mastery Learning strategy to an experimental algebra course that is inter-disciplinary and laboratory-oriented. Ms. Cox received her Master's degree from Western Illinois University and has been using Mastery Learning for two years. She sees students developing a more realistic approach to college courses as a result of Mastery Learning.

CHRIS DIMAS is Director of Computer-Supported Instruction at Chicago City-Wide College and formerly Director of Learning Strategies at Malcolm X College. Since 1972, he has directed the curriculum development of the City Colleges of Chicago's PLATO Project, a computer based learning system. He earned his doctorate in instructional technology from Syracruse University and believes that systems such as PLATO can save valuable time for the instructor as well as help to humanize the instructional process.

RICHARD KAMPWIRTH, Associate Professor of Biology at Truman College, has been using Mastery Learning for eight years and was part of a group of four biology instructors that initiated and developed Mastery Learning at Truman. Dr. Kampwirth earned his doctorate at Northwestern University and sees the objectives and the feedback provided to students on their progress as the main benefits of Mastery Learning.

ANITA LENDWAY is Assistant Professor of Biology at Chicago City-Wide College. She received her Master's degree from Purdue University and has fourteen years teaching experience, five years of it with Mastery Learning. She sees the objectives and the repeated exposure of the student to the material as the main benefits of the technique.

ALAN MEYERS, Assistant Professor at Truman College, received his Master's degree from the University of Illinois at Champaign-Urbana. He is the author and co-author of several books, including Speaking with Confidence and Writing with Confidence, and is currently working on a six-book series in English as a Second Language to be published in 1982 by Scott, Foresman and Company. He views using objectives and giving students the opportunity to relearn materials as the primary benefits of Mastery Learning.

JUDITH MONSAAS is currently completing her doctoral studies with Dr. Bloom at the University of Chicago. She is also working on projects for a number of school systems to develop minimum competency testing programs. Ms. Monsaas has also trained teachers and administrators in the development and use of Mastery Learning procedures and has worked on the development of Mastery Learning reading materials.

DONALD E. RADTKE is an instructor of Business at Daley College. Radtke received his Master's degree in accounting from the University of Illinois at Champaign-Urbana and also holds a CPA certificate. He has used Mastery Learning for two years and believes that students learn how to learn better while learning a highly-structured subject matter.

WYLMARIE NICHOLSON SYKES is Assistant Professor of English at Malcolm X College. She did her doctoral work at the University of Iowa and has sixteen years of teaching experience. She has been using Mastery Learning one year and sees it as encouraging instructors to analyze carefully their course objectives, materials, and procedures while motivating students to greater achievement.

YUNG-MING TSE is Professor of Business at Olive-Harvey College and a Ph.D. candidate at the University of Illinois, Champaign-Urbana. He has been using Mastery Learning for three years in accounting courses and sees learning effectiveness and learning efficiency as the main benefits.

COLLETTE L. WALKER is Associate Professor of English at Wright College and has been using Mastery Learning for three years in reading. She received her Master's degree in that subject from Northeastern Illinois University. She views Mastery Learning as providing a structured approach to a complex and abstract subject without sacrificing any higher level cognitive skills. She also sees it as encouraging student self-motivation.

RICHARD WILLIAMS, Assistant Professor in Mathematics at Malcolm X College, teaches introductory algebra using the mastery strategy. Dr. Williams, who received his Ph.D. from Nova University, has a book in progress for Scott, Foresman and Company entitled Introductory Mathematics with Self-Improvement Strategies. He also has a number of papers on math available through ERIC. Dr. Williams sees Mastery Learning as improving a student's academic performance and attitudes while making teaching more enjoyable.

EASTER O. WRIGHT, Associate Professor of Mathematics at Kennedy-King College, received her Ph.D. from Union Graduate School in Cincinnati and has been using Mastery Learning for four years. She sees it helping students learn how to study, perform at higher levels, and build greater self-confidence.

PARTICIPANTS

Faculty and administrators from the following institutions were present at the first Mastery Learning Conference:

Borough of Manhattan Community College
1633 Broadway
New York, NY 10019

City Colleges of Chicago
180 N. Michigan Ave.
Chicago, IL 60601

College of DuPage
Lambert Rd. and 22nd St.
Glen Ellyn, IL 60137

Dallas Community College District
701 Elm St. Room 400
Dallas, TX 75202

Gallaudet College
Washington, D. C. 20002

The Junior College District of St. Louis
5801 Wilson Ave.
St. Louis, MO 63110

Milwaukee Area Technical College
1015 N. 6th St.
Milwaukee, WI 53203

Morton College
3801 S. Central Ave.
Cicero, IL 60650

Peralta Community College District
300 Grand Ave.
Oakland, CA 94610

Triton College
2000 Fifth Ave.
River Grove, IL 60171

Seton Hall University
South Orange, NJ 07079

AUG 28 1981

ERIC Clearinghouse for Junior Colleges
96 Powell Library Building
University of California
Los Angeles, California 90024